45th Annual Targets, UAVs & Range Operations Symposium & Exhibition
"Tools and Technologies for The Warfighter"
San Diego, CA

29 – 31 October 2007

Agenda

Tuesday, October 30, 2007

Keynote Speaker:
Brigadier General David J. Eichhorn, USAF, Director of Air, Space and Information Operations, Headquarters, Air Force Material Command, Wright-Patterson Air Force Base, Ohio

- ***Joint Close Air Support Enabled by Future Airborne Networking*** wmv format

Session I: ***Ranges and Range Operations***

- Common Range Integrated Instrumentation System (CRIIS), ***Mr. Magdy "Mike" Sorial,*** CRIIS Program Director, 29ARSG/EN, Eglin AFB
- Real Time Trajectory Planning for Targets via Heuristics Search, ***Mr. Luis E. Alvarado, Sr.,*** Systems Control Engineer
- Target Operational and Engineering Support ***Mr. Thomas Dowd, Director,*** Threat/Target Systems Department, Pt. Mugu, CA
- DOT&E Targets Overview, ***Mr. Joshua Messner,*** DOT&E Target Resources, OSD
- JSF Range and Airspace Requirements, ***Major "Digger" Davis,*** HQ ACC/A8F
    1. ***Targets*** QuickTime format

Session II: ***New Technology***

- Low Cost Alternative Target, ***Mr. Larry Berger,*** Chief Engineer, MDSI
    1. ***GT-400 Flight Test*** wmv format
- Joint Ground Robotics Program, ***Mr. Duane Gotvald,*** Deputy Project Manager, PEO GCS Robotic Systems Joint Program
    1. ***QuickTime Video Clip***

Hugh Harris Scholarship Update

Wednesday, October 31, 2007

Session III: ***Current Trends***

- GPS-Based Target Control Software Innovations, ***Mr. Dennis Brooks,*** Project Director, Target Control Systems, US Army TMO, Huntsville, Alabama
- DTRMC, OSD Strategic Plan, ***Mr. Jerry Christensen,*** DOT&E

Session IV: ***Military Programs and Requirements***

- Navy, *Captain Pat Buckley,* USN, PMA-208
    1. *Sales Aren't Up* wmv format
- Air Force, *Michele Brazel,* Squadron Director, 691st Armament Systems Squadron, Eglin AFB, Florida
    1. *691 ARSS* wmv format
- Overview Of U.S. Army, PEO STRI, PM ITTS TMO Activities, ***Mr. Al Brown,*** TMO Deputy Director, PMITTS, PEO STRI
    1. ***Targets Management Office*** wmv format

National Defense Industrial Association

NATIONAL DEFENSE INDUSTRIAL ASSOCIATION
STRENGTH THROUGH INDUSTRY & TECHNOLOGY

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45th Annual Targets, UAV & Range Division Symposium

David Miller
Meggitt Defense Systems
NDIA Target, UAV & Range Ops Division

David Laird
Micros Systems, Inc
Symposium Chair

Session Chairs
Joshua Messner
Craig Tangedal
John Vanbrabant
Charles Farrior
Bob Palmer

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Major Joseph P. Hylan, USMC (Ret)

45th Annual Targets, UAV & Range Division Symposium

Sympsosium Chair:

Mr. David Laird

Micro Systems, Inc.

45th Annual Targets, UAV & Range Division Symposium

Tuesday, October 30, 2007

8:00 AM *Welcome Remarks*
David Laird, Micro Systems, Inc.
Symposium Chair

8:15 AM *Keynote Presentation*
Brigadier General David J. Eichhorn, USAF
Dir, Air, Space and Information Operations
HQ, AFMC

45th Annual Targets, UAV & Range Division Symposium

Tuesday, October 30, 2007

Session I - Ranges & Range Operations

Chair: Dennis Mischel

DOT&E Targets

9:00 AM *Session Introduction*

45th Annual Targets, UAV & Range Division Symposium

Tuesday, October 30, 2007

9:15 AM	***Common Range Integrated Instrumentation System*** **Magdy "Mike" Sorial, CRIIS Program Director**
9:40 AM	***Real Time Trajectory Planning for Targets via Heuristics Approach*** **Manuel Soto, White Sands Missile Range**
10:00AM	***Break – Exhibits Open for Viewing***

45th Annual Targets, UAV & Range Division Symposium

Tuesday, October 30, 2007

10:45AM *Target Operational & Engineering Support*
Thomas Dowd, Dir, Threat Target Systems, Pt Mugu

11:05AM *JSF: Targets & Ranges Test & Training Requirements*
Col Russell Handy, Commander, 33d Fighter Wing

11:50AM *Improvements & Upgrades at the Sea Range*
Karen Draper, Sea Range Test Mgmt Br, Pt Mugu

12:10AM *Willis Howard Award Presentation*
David Miller, Meggitt Defense Systems
NDIA Division Chair

45th Annual Targets, UAV & Range Division Symposium

12:25 – 1:45 ***Lunch – Exhibit Hall***

45th Annual Targets, UAV & Range Division Symposium

Tuesday, October 30, 2007

Session II – New Technology

Chair: Craig Tangedal

1:45 PM ***Session Introduction***

45th Annual Targets, UAV & Range Division Symposium

Tuesday, October 30, 2007

2:05PM *Improvised Explosive Devices*

Captain Jeffrey Timbore, USN, JIEDDO

2:25PM *Hammerhead, NATO Qualified Sea Surface Target System*

Spencer Fraser, MDS Canada

2:45PM *Break – Exhibit Hall*

45th Annual Targets, UAV & Range Division Symposium

Tuesday, October 30, 2007

3:20PM *GT-400 Low Cost Alternative Target*
Larry Berger, Chief Engineer, MDSI

3:40PM *Joint Ground Robotics Program*
Duane Gotvald, Dep Proj Mgr, PEO GCS Robotic Systems Joint Program Office

4:00PM *Hugh Harris Scholarship Update*
Mr. Cort Proctor, Micro Systems, Inc

4:30PM-6:00PM *Reception in Exhibit Hall*

45th Annual Targets, UAV & Range Division Symposium

Wednesday, October 31, 2007

8:00AM *Welcome and Keynote Introduction*

David Laird, Micro Systems, Inc, Symposium Chair

8:15AM *Keynote*

Mr. John Salafia, Director, Target Programs, Unmanned Systems, Northrop Grumman Integrated Systems

45th Annual Targets, UAV & Range Division Symposium

Wednesday, October 31, 2007

Session III – Current Trends

Chair: JohnVanBrabant

Northrop Grumman Corporation

9:00AM *Session Introduction*

45th Annual Targets, UAV & Range Division Symposium

Wednesday, October 31, 2007

9:15AM *GPS-Based Target Control Software Innovations*

Dennis Brooks, Proj Dir, Tgt Control Sys, US Army TMO

9:35AM *Break in Exhibit Hall*

10:00AM *General Session Resumes*

45th Annual Targets, UAV & Range Division Symposium

Wednesday, October 31, 2007

10:00AM	***Super Sonic Sea Skimming Target – A Lower Cost Alternative*, LCDR E. Ferguson, RCN, NDHQ**
10:20AM	***DTRMC, OSD Strategic Plan*** **Jerry Christensen, DOT&E**
10:40	***Target Management Initiative*** **Ken McCormick, DOT&E**
11:10AM	***Surface Target Laser Aim Scoring System*** **Rob Couture, Program Dir, Meggitt Defense Systems**
11:30AM	***DAU: Contingency Contracting*** **Joel Brown, DAU, San Diego**
11:50	***Lunch* – Exhibit Hall**

45th Annual Targets, UAV & Range Division Symposium

Wednesday, October 31, 2007

Session IV – Military Programs & Requirements

Chair: Charles Farrior

Army TMO

1:30pm ***Session Introduction***

45th Annual Targets, UAV & Range Division Symposium

Wednesday, October 31, 2007

1:45PM *Army*

Mr. Steve Milburn, TMO, Huntsville

2:15PM *Navy*

Captain Pat Buckley, USN, PMA-208

2:45PM *Air Force*

Michele Brazel, Sqdn Director, 691st Armt Sys Sqdn

45th Annual Targets, UAV & Range Division Symposium

Wednesday, October 31, 2007

3:15PM *Concluding Remarks*

David Laird, Symposium Chair

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GT-400 Glide Target Update & Live Fire Experience

30 October 2007

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GT-400 Low Cost Aerial Target

ASTER-15 from the
Carrier Charles De Gaulle
Mediterranean Sea
December 2006

GT-400 Development Goals

- Provide > 300 Kts Speed
- Provide > 30 nmi Safety Range
- Operable by tow target service providers (business jet) on a dial-a-sortie basis
- Low cost, expendable
- Long on-time presentation by operating initialy as an ordinary tow targets
- Low rcs (Allows replication of low RCS threats)
- Reduce Total Mission Cost

GT-400 Data

WEIGHT: 180 lbs

LENGTH: 103 in

DIAMETER: 7.5 in

MAX SPEED: Mach .8 or 450 KCAS

STALL SPEED: 160 KCAS

RCS: < 0.1 Sq Meters (head on un-augmented)

AUGMENTATION AVAILABLE:

RCS – Active and Passive

Infrared – FIRE-40 (nose or tail)

Smoke, Flare and Chaff

SCORING: CMDI-118 MICRODOPS

GT-400 Operational Scenario

FLY TO RANGE – TARGET CARRIED ON STANDARD REELING MACHINE

REEL OUT TARGET 30 - 1000 METERS

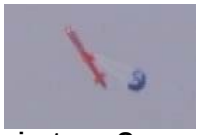
AT PLANNED LOCATION, ALTITUDE, AIRSPEED AND HEADING . . . RELEASE GT-400 FROM TOWLINE

TARGET GLIDES PRE-PROGRAMMED COURSE USING ONBOARD AUTOPILOT AND GPS NAVIGATION

MONITORED BY OPERATOR IN LAUNCH AIRCRAFT AND/OR REMOTE SAFETY OFFICER; BOTH HAVE CUT DOWN ABILITY

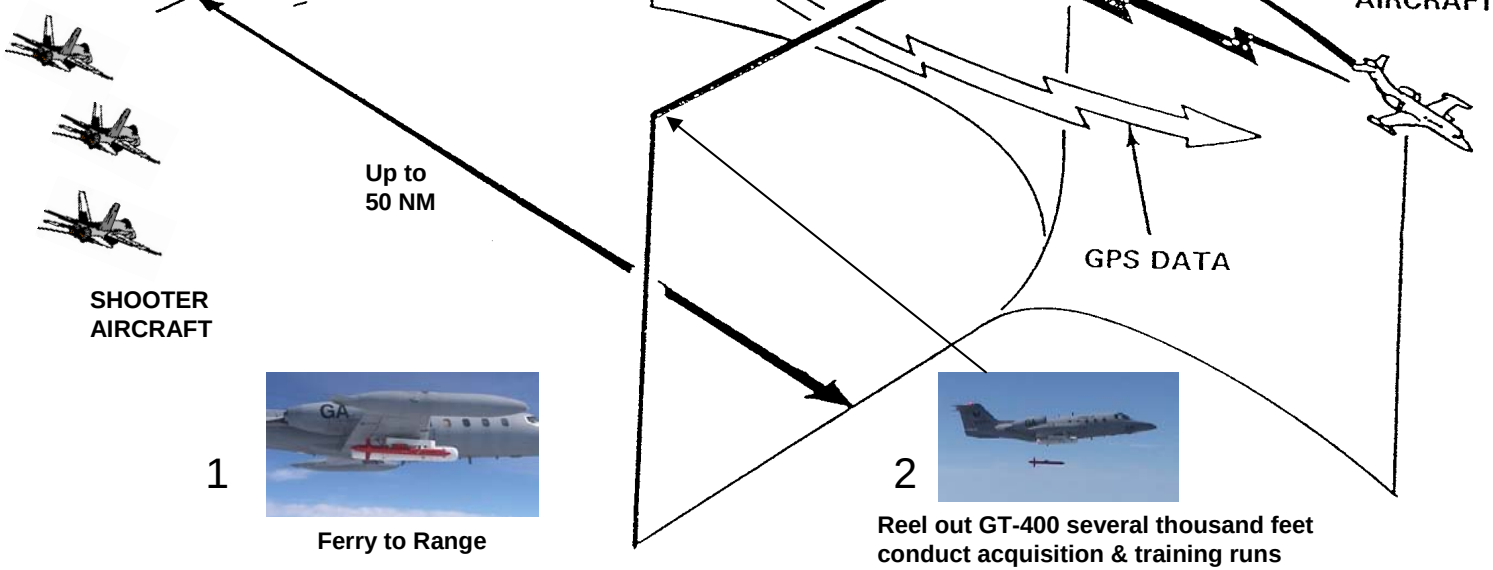
GT-400 Operation

4
Accelerate to mission speed GPS guided, maneuver as planned



5
Terminate on Command (if required)

3
Release from towline



1
Ferry to Range

2
Reel out GT-400 several thousand feet conduct acquisition & training runs

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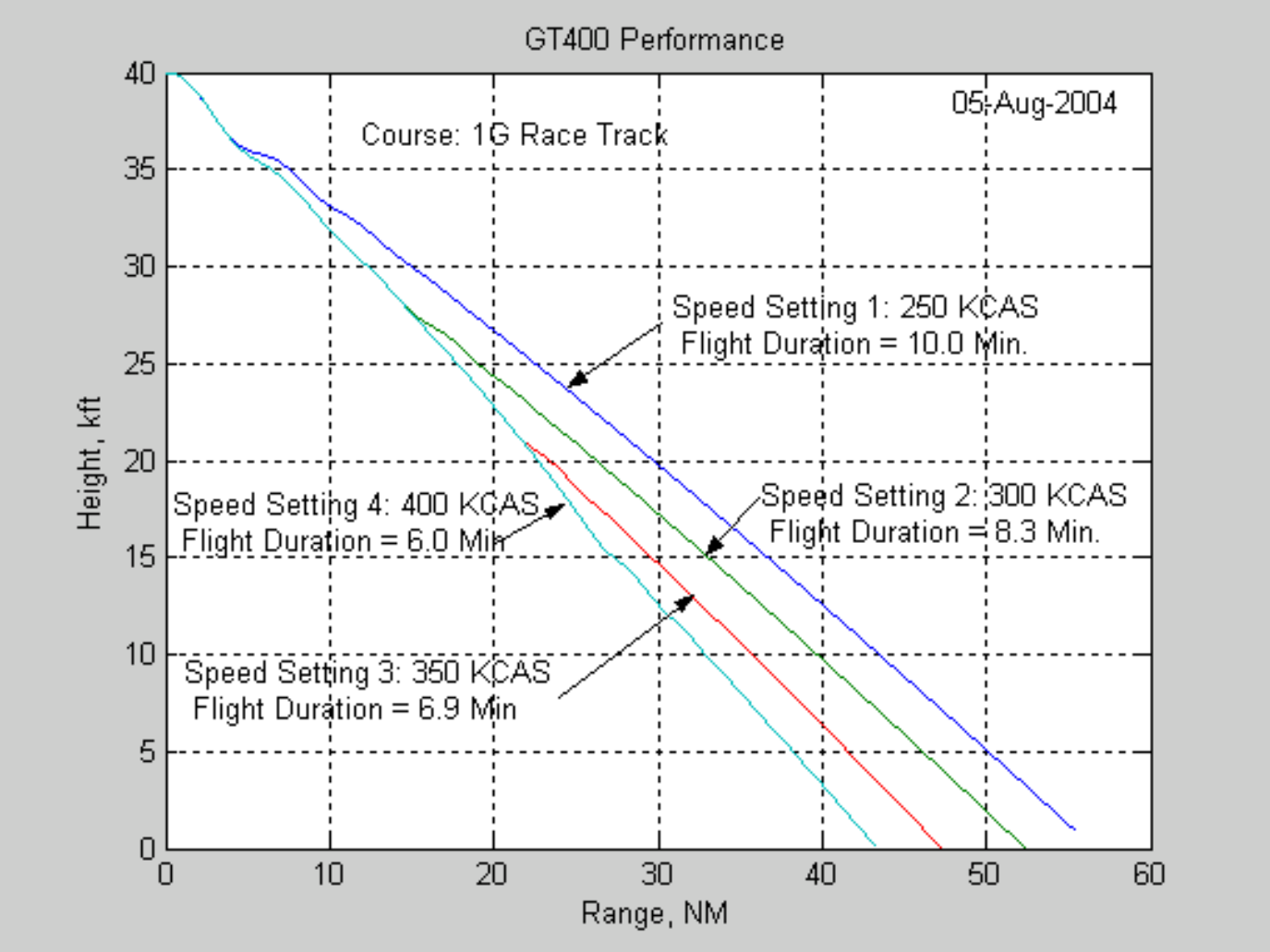
GT-400 Typical Operational Scenario

FERRY TO RANGE	**30 minutes**
PRACTICE ENGAGEMENT	**50 minutes**
GT-400 ENGAGEMENT	**10 minutes**
FERRY HOME	**30 minutes**
TOTAL FLIGHT TIME	**2 hours**

GT-400 Maximum Duration/Range Profile



GT-400 Target Operations

Military Jets

AGTS-36 Tow System

Contractor

. . . Dial-a-Sortie

“Mark, I’d like a target tomorrow at 0900. I’ll e-mail the pattern and coordinates.”

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GT-400 Advantages

- Low Cost
- Convenient: Supports contractor operated ‘dial-a-sortie’
- Deliverable to remote ranges
- Long time on station to conduct practice runs (2 hours)
- Visual range Sweep by delivering aircraft
- Mission can be aborted prior to launch (e.g., fishing boats on range) without loss of assets
- Safety; finite footprint limited by laws of physics
- Environmentally friendly: No fuel, No pyrotechnics
- No post flight recovery assets or effort required
- Radar and IR signatures can be tailored from near zero to as desired

GT-400 Live Fire Experience

Air to Air

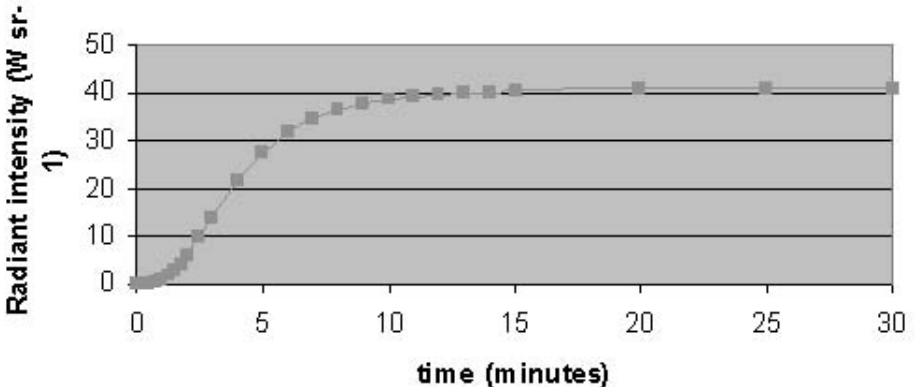
Date	User	Shooter	Missile	Range	Result
December 2005	USAF	F-16 (2 ea) F-15 (2 ea)	AIM-120	Tyndall AFB Gulf Range	6 missiles fired All reported as Direct Hits
February 2007	Royal Australian Air Force	F-18 (4 ea)	AMRAAM	Restricted Area 453	Fwd aspect acquisition from 30-40 nm, 1 missile fired from 20 nm, Direct Kill

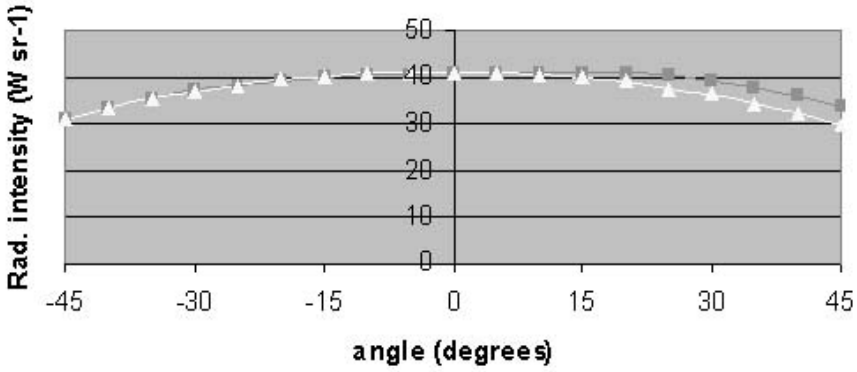
Surface to Air

Date	User	Shooter	Missile	Range	Result
December 2006	French Navy	Frigate	SM1-MR	Mediterranean Sea	2 hours of practice engagements followed by release and 1 missile fired Direct Kill
December 2006	French Navy	Nuclear Powered Carrier	ASTER-15	Mediterranean Sea	I missile fired Direct Kill

GT-400 IR Augmentation FIRE-40

FIRE-40 output W/Str (3.0-5.0 micron band) versus time after turn on
Input Power = 24 VDC, 14.5 A = 350 watts (Note 1)





One Hour Continuous
On Duration in GT-400

May be turned On/Off
As Desired

Note 1. Data measured by US Navy Laboratory at China Lake

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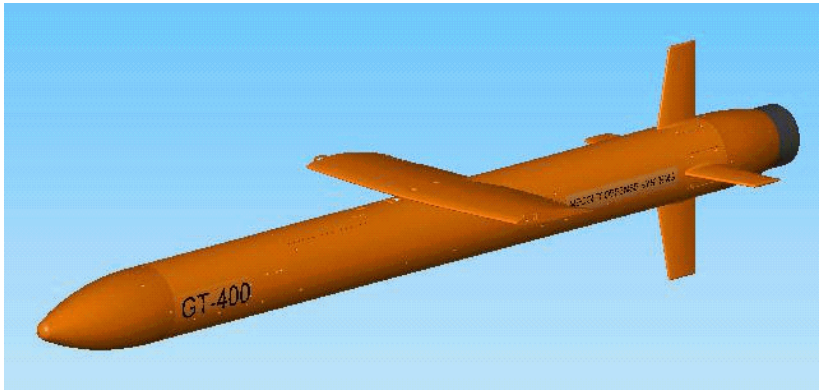
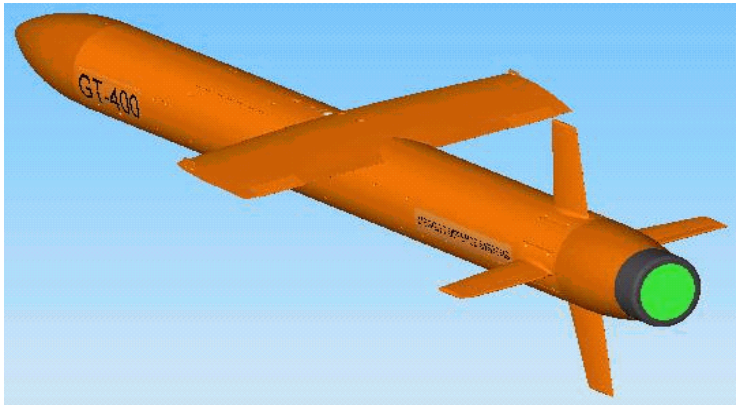
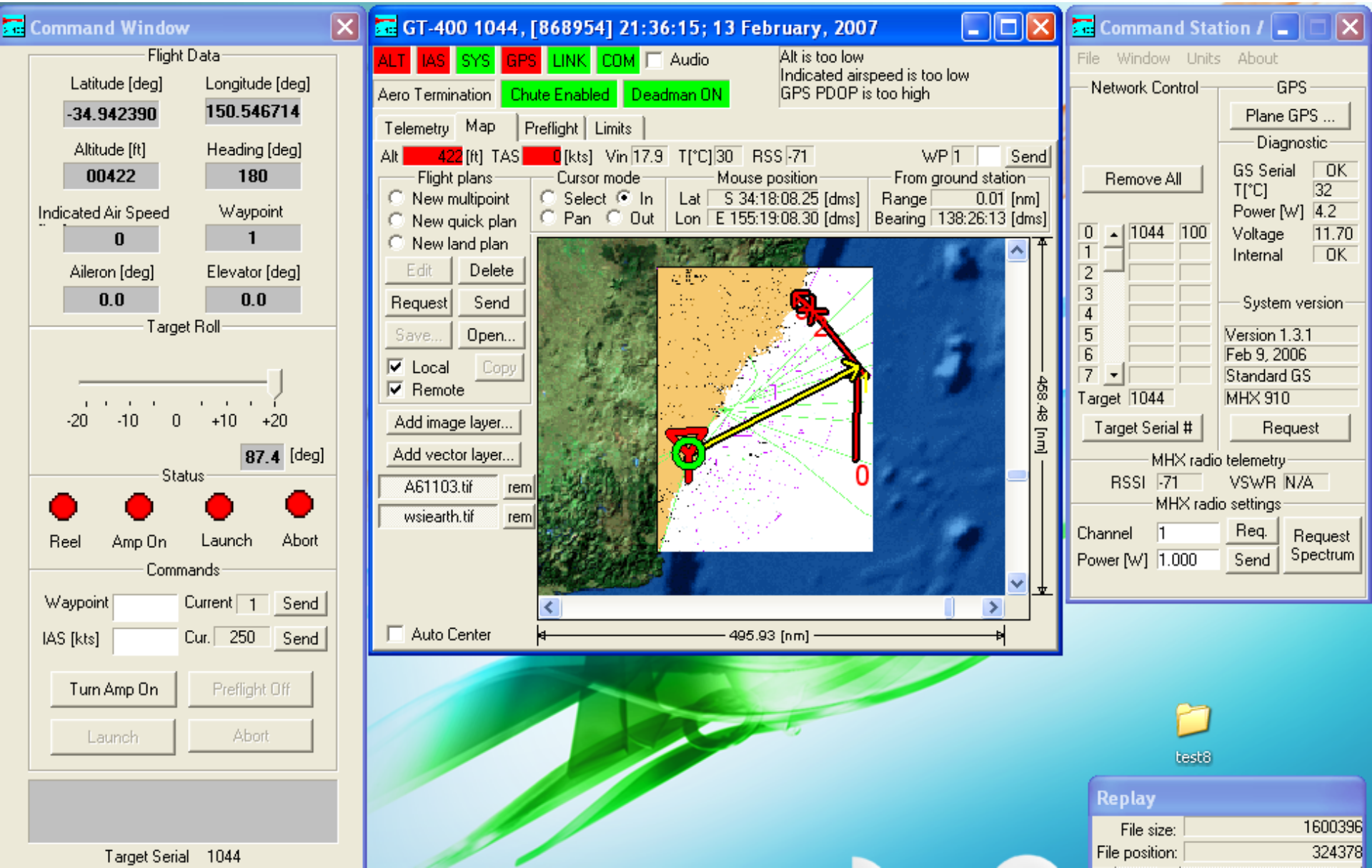
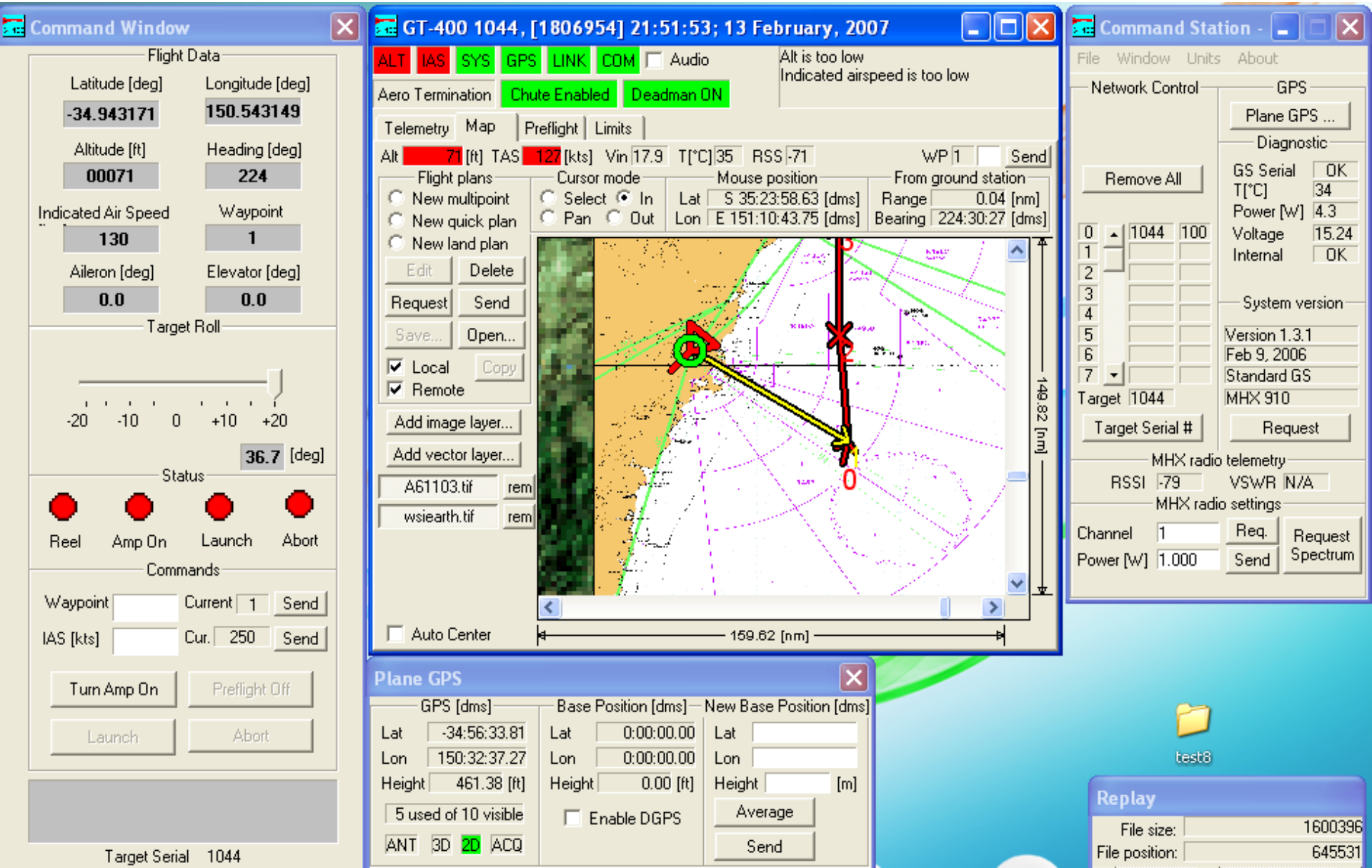
GT-400 IR Augmentation
FIRE-40 Installation

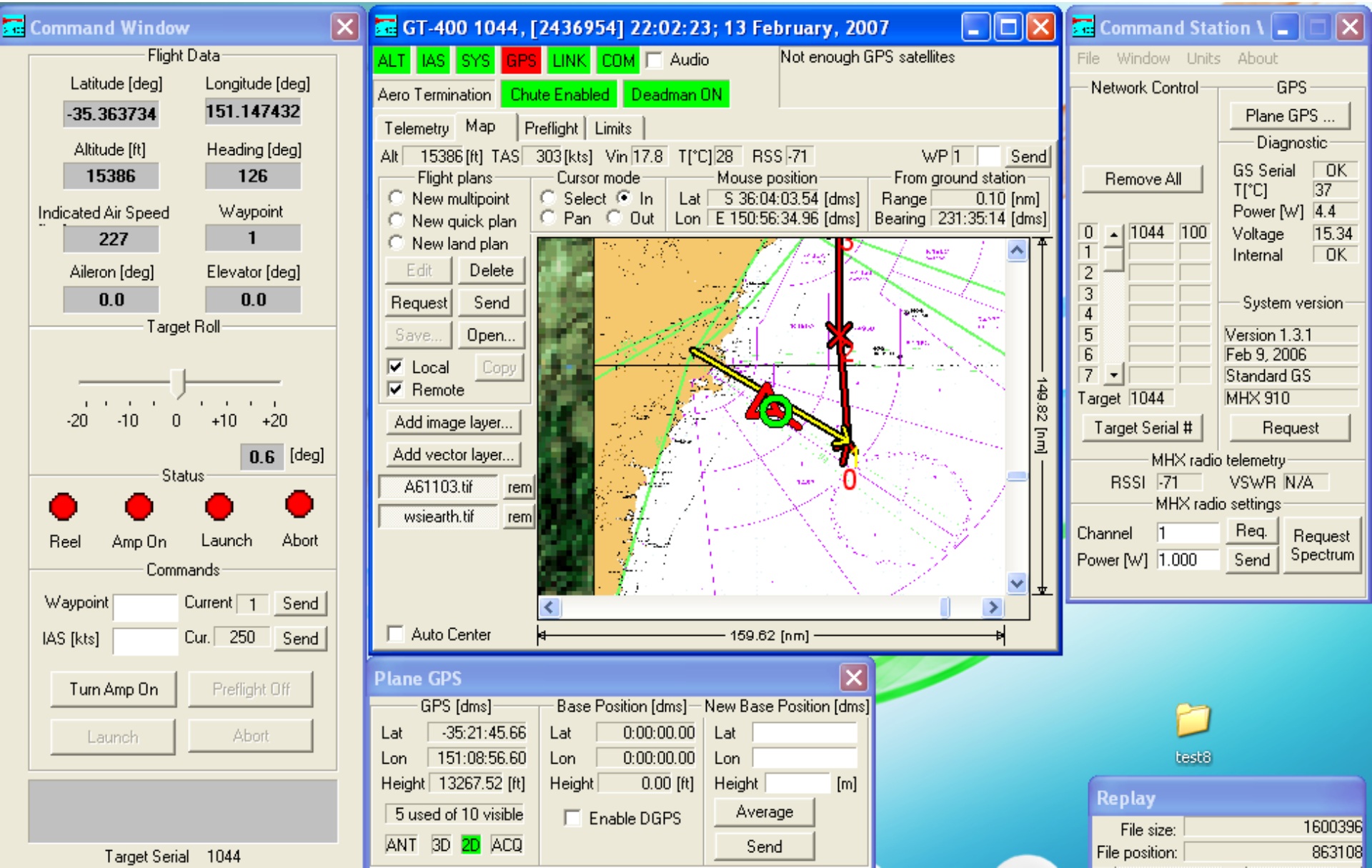




Length (inch)	100
Diameter (inch)	7.5
Wing Span (inch)	28.5
Weight (lb)	180


Command Window
Flight Data
Latitude [deg]
-34.942390
Longitude [deg]
150.546714
Altitude [ft]
00422
Heading [deg]
180
Indicated Air Speed
0
Waypoint
1
Aileron [deg]
0.0
Elevator [deg]
0.0
Target Roll
-20 -10 0 +10 +20
87.4 [deg]
Status
Reel
Amp On
Launch
Abort
Commands
Waypoint
Current 1
Send
IAS [kts]
Cur. 250
Send
Turn Amp On
Preflight Off
Launch
Abort
Target Serial 1044
GT-400 1044, [868954] 21:36:15; 13 February, 2007
ALT IAS SYS GPS LINK COM Audio
Alt is too low
Indicated airspeed is too low
GPS PDOP is too high
Aero Termination
Chute Enabled
Deadman ON
Telemetry Map Preflight Limits
Alt 422 [ft] TAS 0 [kts] Vin 17.9 T[°C] 30 RSS -71
WP 1 Send
Flight plans
New multipoint
New quick plan
New land plan
Edit Delete
Request Send
Save... Open...
Local Copy
Remote
Add image layer...
Add vector layer...
A61103.tif rem
wsiearth.tif rem
Cursor mode
Select In
Pan Out
Mouse position
Lat S 34:18:08.25 [dms]
Lon E 155:19:08.30 [dms]
From ground station
Range 0.01 [nm]
Bearing 138:26:13 [dms]
458.48 [nm]
Auto Center
495.93 [nm]
Command Station /
File Window Units About
Network Control
GPS
Plane GPS ...
Diagnostic
Remove All
GS Serial OK
T[°C] 32
Power [W] 4.2
Voltage 11.70
Internal OK
0 1044 100
1
2
3
4
5
6
7
Target 1044
System version
Version 1.3.1
Feb 9, 2006
Standard GS
MHX 910
Target Serial #
Request
MHX radio telemetry
RSSI -71
VSWR N/A
MHX radio settings
Channel 1
Req.
Request Spectrum
Power [W] 1.000
Send
test8
Replay
File size: 1600396
File position: 324378


Command Window
Flight Data
Latitude [deg]
-34.943171
Longitude [deg]
150.543149
Altitude [ft]
00071
Heading [deg]
224
Indicated Air Speed
130
Waypoint
1
Aileron [deg]
0.0
Elevator [deg]
0.0
Target Roll
-20 -10 0 +10 +20
36.7 [deg]
Status
Reel
Amp On
Launch
Abort
Commands
Waypoint
Current 1
Send
IAS [kts]
Cur. 250
Send
Turn Amp On
Preflight Off
Launch
Abort
Target Serial 1044
GT-400 1044, [1806954] 21:51:53; 13 February, 2007
ALT IAS SYS GPS LINK COM Audio
Alt is too low
Indicated airspeed is too low
Aero Termination
Chute Enabled
Deadman ON
Telemetry Map Preflight Limits
Alt 71 [ft] TAS 127 [kts] Vin 17.9 T[°C] 35 RSS -71
WP 1 Send
Flight plans
New multipoint
New quick plan
New land plan
Edit Delete
Request Send
Save... Open...
Local Copy
Remote
Add image layer...
Add vector layer...
A61103.tif rem
wsiearth.tif rem
Cursor mode
Select In
Pan Out
Mouse position
Lat S 35:23:58.63 [dms]
Lon E 151:10:43.75 [dms]
From ground station
Range 0.04 [nm]
Bearing 224:30:27 [dms]
149.82 [nm]
Auto Center
159.62 [nm]
Command Station -
File Window Units About
Network Control
Remove All
0 1044 100
1
2
3
4
5
6
7
Target 1044
Target Serial #
GPS
Plane GPS ...
Diagnostic
GS Serial OK
T[°C] 34
Power [W] 4.3
Voltage 15.24
Internal OK
System version
Version 1.3.1
Feb 9, 2006
Standard GS
MHX 910
Request
MHX radio telemetry
RSSI -79 VSWR N/A
MHX radio settings
Channel 1 Req.
Power [W] 1.000 Send
Request Spectrum
Plane GPS
GPS [dms]
Lat -34:56:33.81
Lon 150:32:37.27
Height 461.38 [ft]
5 used of 10 visible
ANT 3D 2D ACQ
Base Position [dms]
Lat 0:00:00.00
Lon 0:00:00.00
Height 0.00 [ft]
Enable DGPS
New Base Position [dms]
Lat
Lon
Height [m]
Average
Send
test8
Replay
File size: 1600396
File position: 645531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Latitude [deg]
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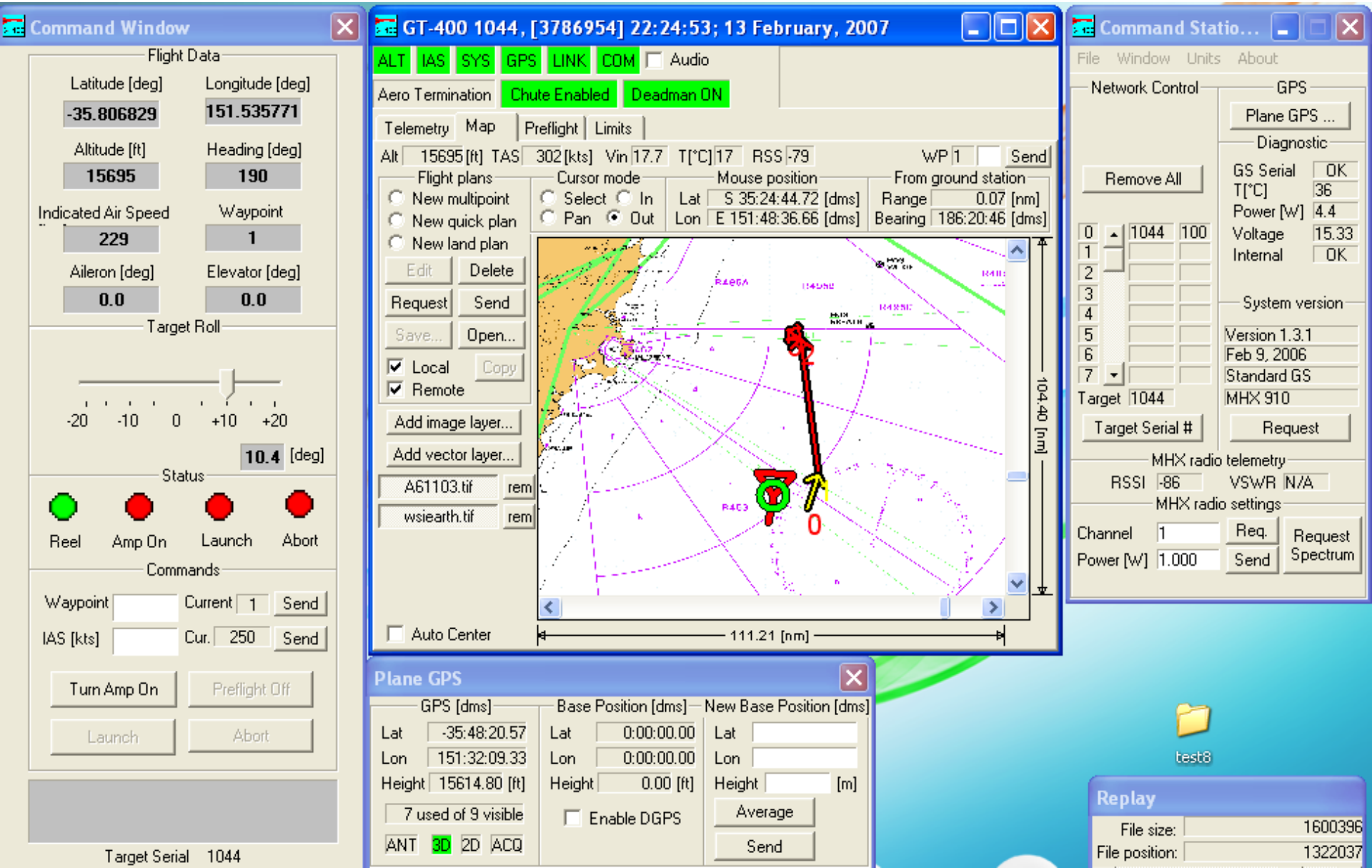
Longitude [deg]
151.147432
Altitude [ft]
15386
Heading [deg]
126
Indicated Air Speed
227
Waypoint
1
Aileron [deg]
0.0
Elevator [deg]
0.0
Target Roll
-20 -10 0 +10 +20
0.6 [deg]
Status
Reel
Amp On
Launch
Abort
Commands
Waypoint
Current 1
Send
IAS [kts]
Cur. 250
Send
Turn Amp On
Preflight Off
Launch
Abort
Target Serial 1044
GT-400 1044, [2436954] 22:02:23; 13 February, 2007
ALT IAS SYS GPS LINK COM Audio
Not enough GPS satellites
Aero Termination
Chute Enabled
Deadman ON
Telemetry Map Preflight Limits
Alt 15386 [ft] TAS 303 [kts] Vin 17.8 T[°C] 28 RSS -71
WP 1 Send
Flight plans
New multipoint
New quick plan
New land plan
Edit Delete
Request Send
Save... Open...
Local Copy
Remote
Add image layer...
Add vector layer...
A61103.tif rem
wsiearth.tif rem
Cursor mode
Select In
Pan Out
Mouse position
Lat S 36:04:03.54 [dms]
Lon E 150:56:34.96 [dms]
From ground station
Range 0.10 [nm]
Bearing 231:35:14 [dms]
149.82 [nm]
Auto Center
159.62 [nm]
Plane GPS
GPS [dms]
Lat -35:21:45.66
Lon 151:08:56.60
Height 13267.52 [ft]
5 used of 10 visible
ANT 3D 2D ACQ
Base Position [dms]
Lat 0:00:00.00
Lon 0:00:00.00
Height 0.00 [ft]
Enable DGPS
New Base Position [dms]
Lat
Lon
Height [m]
Average
Send
Command Station \
File Window Units About
Network Control
Remove All
0 1044 100
1
2
3
4
5
6
7
Target 1044
Target Serial #
GPS
Plane GPS ...
Diagnostic
GS Serial OK
T[°C] 37
Power [W] 4.4
Voltage 15.34
Internal OK
System version
Version 1.3.1
Feb 9, 2006
Standard GS
MHX 910
Request
MHX radio telemetry
RSSI -71 VSWR N/A
MHX radio settings
Channel 1 Req.
Power [W] 1.000 Send
Request Spectrum
test8
Replay
File size: 1600396
File position: 863108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Flight Data
Latitude [deg]
-35.806829
Longitude [deg]
151.535771
Altitude [ft]
15695
Heading [deg]
190
Indicated Air Speed
229
Waypoint
1
Aileron [deg]
0.0
Elevator [deg]
0.0
Target Roll
-20 -10 0 +10 +20
10.4 [deg]
Status
Reel
Amp On
Launch
Abort
Commands
Waypoint
Current 1
Send
IAS [kts]
Cur. 250
Send
Turn Amp On
Preflight Off
Launch
Abort
Target Serial 1044
GT-400 1044, [3786954] 22:24:53; 13 February, 2007
ALT IAS SYS GPS LINK COM Audio
Aero Termination
Chute Enabled
Deadman ON
Telemetry Map Preflight Limits
Alt 15695 [ft] TAS 302 [kts] Vin 17.7 T[°C] 17 RSS -79
WP 1 Send
Flight plans
New multipoint
New quick plan
New land plan
Edit Delete
Request Send
Save... Open...
Local Copy
Remote
Add image layer...
Add vector layer...
A61103.tif rem
wsiearth.tif rem
Cursor mode
Select In
Pan Out
Mouse position
Lat S 35:24:44.72 [dms]
Lon E 151:48:36.66 [dms]
From ground station
Range 0.07 [nm]
Bearing 186:20:46 [dms]
104.40 [nm]
Auto Center
111.21 [nm]
Plane GPS
GPS [dms]
Lat -35:48:20.57
Lon 151:32:09.33
Height 15614.80 [ft]
7 used of 9 visible
ANT 3D 2D ACQ
Base Position [dms]
Lat 0:00:00.00
Lon 0:00:00.00
Height 0.00 [ft]
Enable DGPS
New Base Position [dms]
Lat
Lon
Height [m]
Average
Send
Command Statio...
File Window Units About
Network Control
Remove All
0 1044 100
1
2
3
4
5
6
7
Target 1044
Target Serial #
GPS
Plane GPS ...
Diagnostic
GS Serial OK
T[°C] 36
Power [W] 4.4
Voltage 15.33
Internal OK
System version
Version 1.3.1
Feb 9, 2006
Standard GS
MHX 910
Request
MHX radio telemetry
RSSI -86 VSWR N/A
MHX radio settings
Channel 1 Req.
Power [W] 1.000 Send
Request Spectrum
test8
Replay
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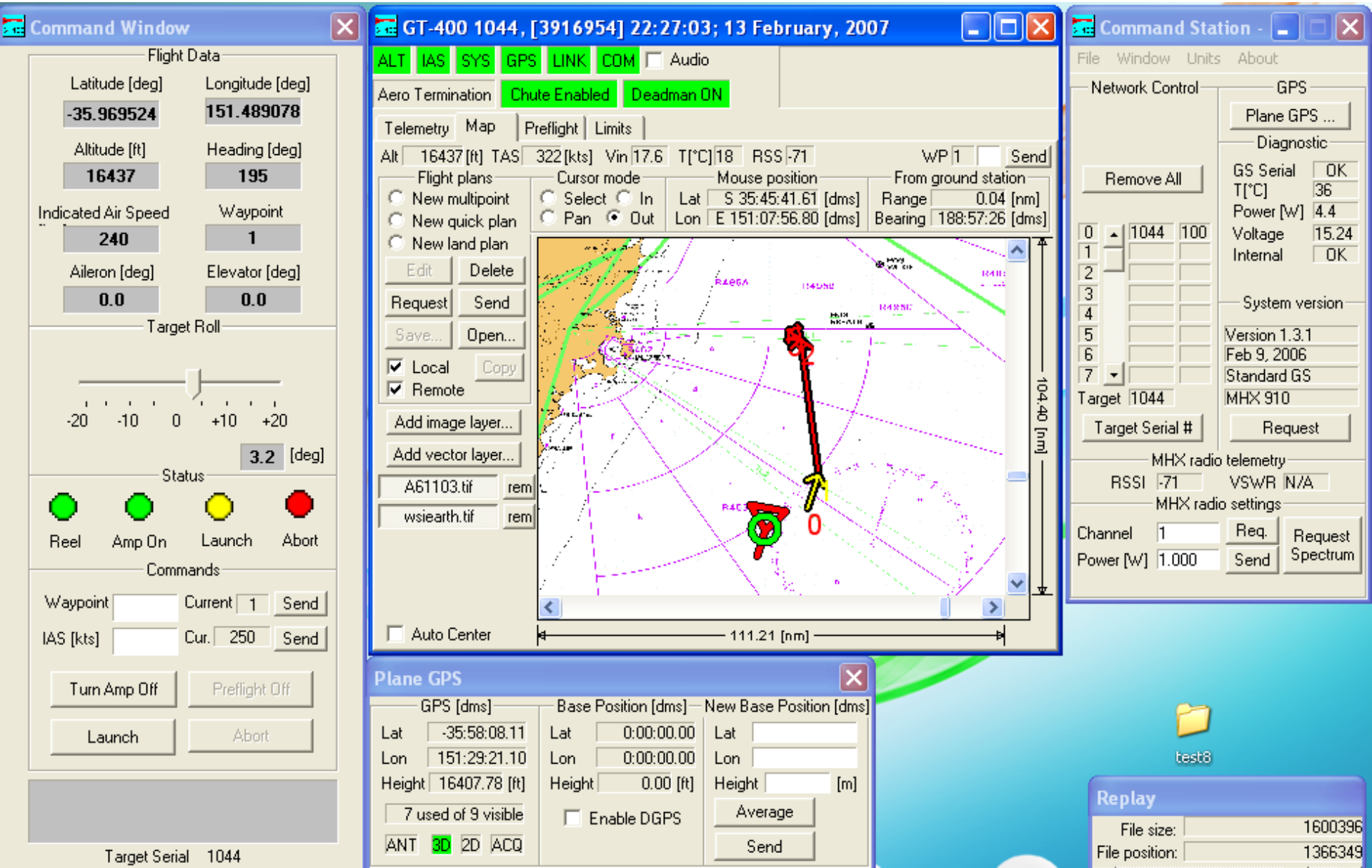
File position: 1322037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Latitude [deg]
-35.969524
Longitude [deg]
151.489078
Altitude [ft]
16437
Heading [deg]
195
Indicated Air Speed
240
Waypoint
1
Aileron [deg]
0.0
Elevator [deg]
0.0
Target Roll
-20 -10 0 +10 +20
3.2 [deg]
Status
Reel
Amp On
Launch
Abort
Commands
Waypoint
Current 1
Send
IAS [kts]
Cur. 250
Send
Turn Amp Off
Preflight Off
Launch
Abort
Target Serial 1044
GT-400 1044, [3916954] 22:27:03; 13 February, 2007
ALT IAS SYS GPS LINK COM Audio
Aero Termination
Chute Enabled
Deadman ON
Telemetry Map Preflight Limits
Alt 16437 [ft] TAS 322 [kts] Vin 17.6 T[°C] 18 RSS -71
WP 1 Send
Flight plans
New multipoint
New quick plan
New land plan
Edit Delete
Request Send
Save... Open...
Local Copy
Remote
Add image layer...
Add vector layer...
A61103.tif rem
wsiearth.tif rem
Cursor mode
Select In
Pan Out
Mouse position
Lat S 35:45:41.61 [dms]
Lon E 151:07:56.80 [dms]
From ground station
Range 0.04 [nm]
Bearing 188:57:26 [dms]
104.40 [nm]
Auto Center
111.21 [nm]
Plane GPS
GPS [dms]
Lat -35:58:08.11
Lon 151:29:21.10
Height 16407.78 [ft]
7 used of 9 visible
ANT 3D 2D ACQ
Base Position [dms]
Lat 0:00:00.00
Lon 0:00:00.00
Height 0.00 [ft]
Enable DGPS
New Base Position [dms]
Lat
Lon
Height [m]
Average
Send
Command Station -
File Window Units About
Network Control
Remove All
0 1044 100
1
2
3
4
5
6
7
Target 1044
Target Serial #
GPS
Plane GPS ...
Diagnostic
GS Serial OK
T[°C] 36
Power [W] 4.4
Voltage 15.24
Internal OK
System version
Version 1.3.1
Feb 9, 2006
Standard GS
MHX 910
Request
MHX radio telemetry
RSSI -71 VSWR N/A
MHX radio settings
Channel 1 Req.
Power [W] 1.000 Send
Request Spectrum
test8
Replay
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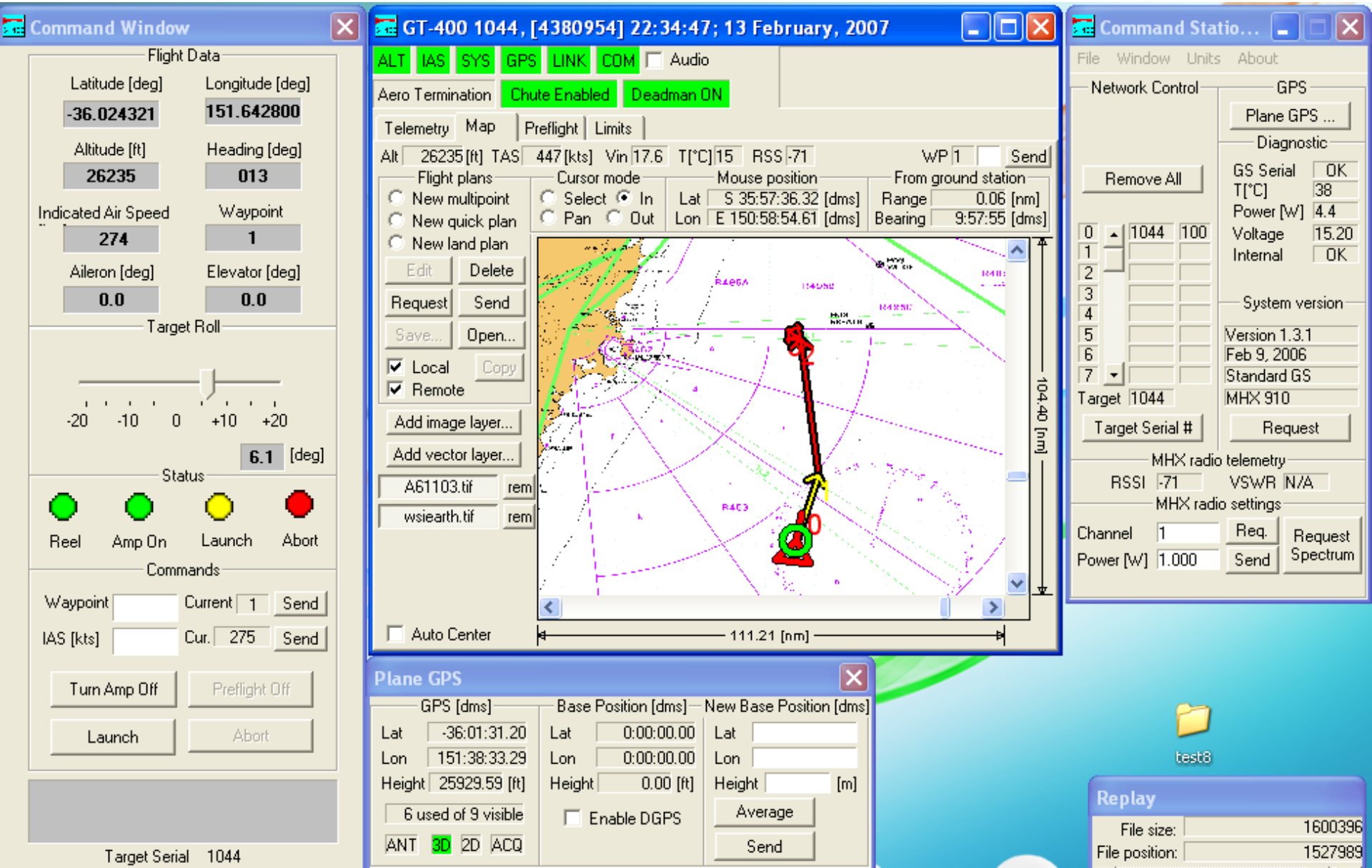
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Altitude [ft]
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Heading [deg]
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Indicated Air Speed
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Waypoint
1
Aileron [deg]
0.0
Elevator [deg]
0.0
Target Roll
-20 -10 0 +10 +20
6.1 [deg]
Status
Reel
Amp On
Launch
Abort
Commands
Waypoint
Current 1 Send
IAS [kts]
Cur. 275 Send
Turn Amp Off
Preflight Off
Launch
Abort
Target Serial 1044
GT-400 1044, [4380954] 22:34:47; 13 February, 2007
ALT IAS SYS GPS LINK COM Audio
Aero Termination
Chute Enabled
Deadman ON
Telemetry Map Preflight Limits
Alt 26235 [ft] TAS 447 [kts] Vin 17.6 T[°C] 15 RSS -71
WP 1 Send
Flight plans
New multipoint
New quick plan
New land plan
Edit Delete
Request Send
Save... Open...
Local Copy
Remote
Add image layer...
Add vector layer...
A61103.tif rem
wsiearth.tif rem
Cursor mode
Select In
Pan Out
Mouse position
Lat S 35:57:36.32 [dms]
Lon E 150:58:54.61 [dms]
From ground station
Range 0.06 [nm]
Bearing 9:57:55 [dms]
104.40 [nm]
Auto Center
111.21 [nm]
Plane GPS
GPS [dms]
Lat -36:01:31.20
Lon 151:38:33.29
Height 25929.59 [ft]
6 used of 9 visible
ANT 3D 2D ACQ
Base Position [dms]
Lat 0:00:00.00
Lon 0:00:00.00
Height 0.00 [ft]
Enable DGPS
New Base Position [dms]
Lat
Lon
Height [m]
Average
Send
Command Statio...
File Window Units About
Network Control
Remove All
0 1044 100
1
2
3
4
5
6
7
Target 1044
Target Serial #
GPS
Plane GPS ...
Diagnostic
GS Serial OK
T[°C] 38
Power [W] 4.4
Voltage 15.20
Internal OK
System version
Version 1.3.1
Feb 9, 2006
Standard GS
MHX 910
Request
MHX radio telemetry
RSSI -71 VSWR N/A
MHX radio settings
Channel 1 Req.
Power [W] 1.000 Send
Request Spectrum
test8
Replay
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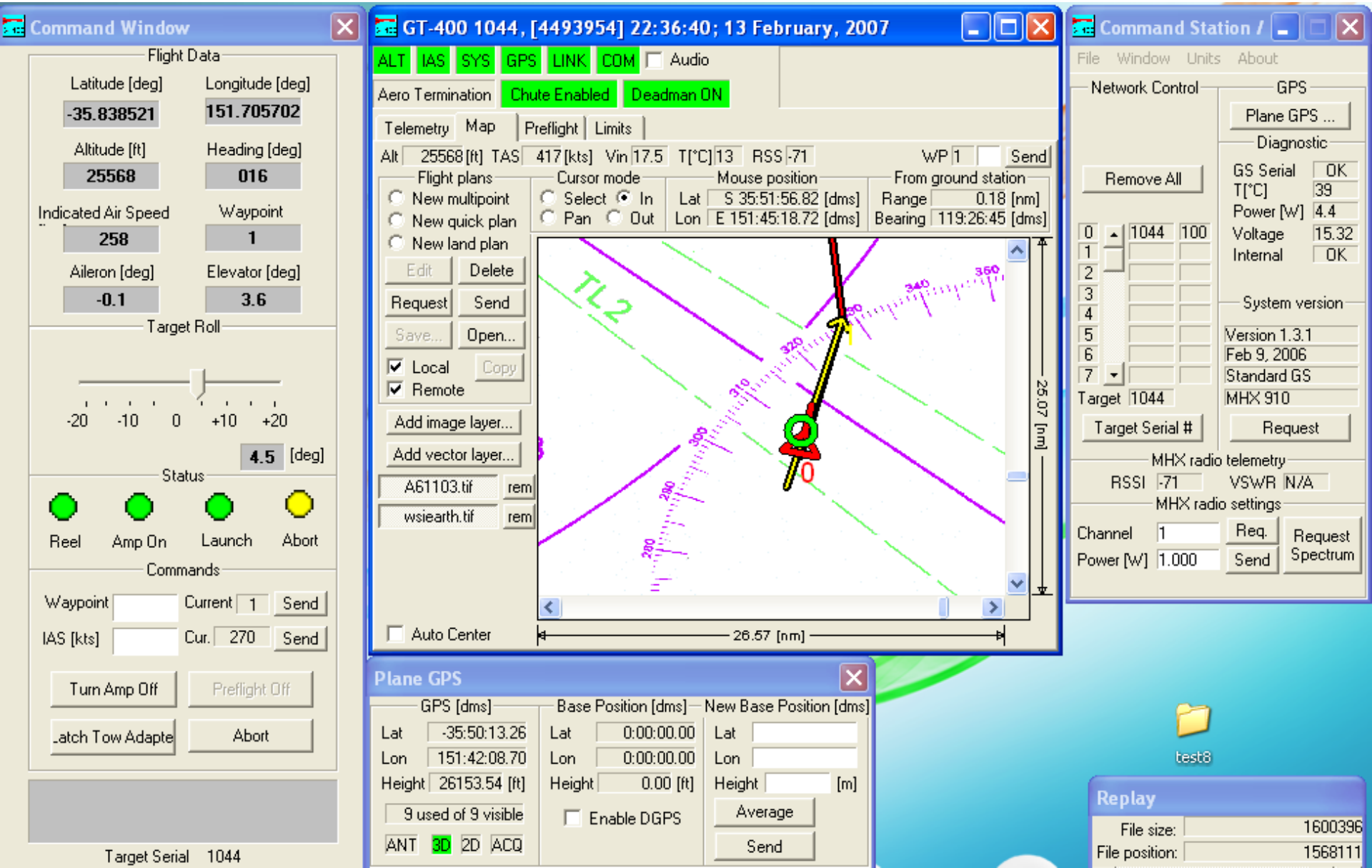
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Flight Data
Latitude [deg]
-35.838521
Longitude [deg]
151.705702
Altitude [ft]
25568
Heading [deg]
016
Indicated Air Speed
258
Waypoint
1
Aileron [deg]
-0.1
Elevator [deg]
3.6
Target Roll
-20 -10 0 +10 +20
4.5 [deg]
Status
Reel
Amp On
Launch
Abort
Commands
Waypoint
Current 1
Send
IAS [kts]
Cur. 270
Send
Turn Amp Off
Preflight Off
Latch Tow Adapte
Abort
Target Serial 1044
GT-400 1044, [4493954] 22:36:40; 13 February, 2007
ALT IAS SYS GPS LINK COM Audio
Aero Termination
Chute Enabled
Deadman ON
Telemetry Map Preflight Limits
Alt 25568 [ft] TAS 417 [kts] Vin 17.5 T[°C] 13 RSS -71
WP 1 Send
Flight plans
New multipoint
New quick plan
New land plan
Edit Delete
Request Send
Save... Open...
Local Copy
Remote
Add image layer...
Add vector layer...
A61103.tif rem
wsiearth.tif rem
Cursor mode
Select In
Pan Out
Mouse position
Lat S 35:51:56.82 [dms]
Lon E 151:45:18.72 [dms]
From ground station
Range 0.18 [nm]
Bearing 119:26:45 [dms]
TL2
25.07 [nm]
Auto Center
26.57 [nm]
Plane GPS
GPS [dms]
Lat -35:50:13.26
Lon 151:42:08.70
Height 26153.54 [ft]
9 used of 9 visible
ANT 3D 2D ACQ
Base Position [dms]
Lat 0:00:00.00
Lon 0:00:00.00
Height 0.00 [ft]
Enable DGPS
New Base Position [dms]
Lat
Lon
Height [m]
Average
Send
Command Station /
File Window Units About
Network Control
Remove All
Target 1044
Target Serial #
GPS
Plane GPS ...
Diagnostic
GS Serial OK
T[°C] 39
Power [W] 4.4
Voltage 15.32
Internal OK
System version
Version 1.3.1
Feb 9, 2006
Standard GS
MHX 910
Request
MHX radio telemetry
RSSI -71 VSWR N/A
MHX radio settings
Channel 1 Req.
Power [W] 1.000 Send
Request Spectrum
test8
Replay
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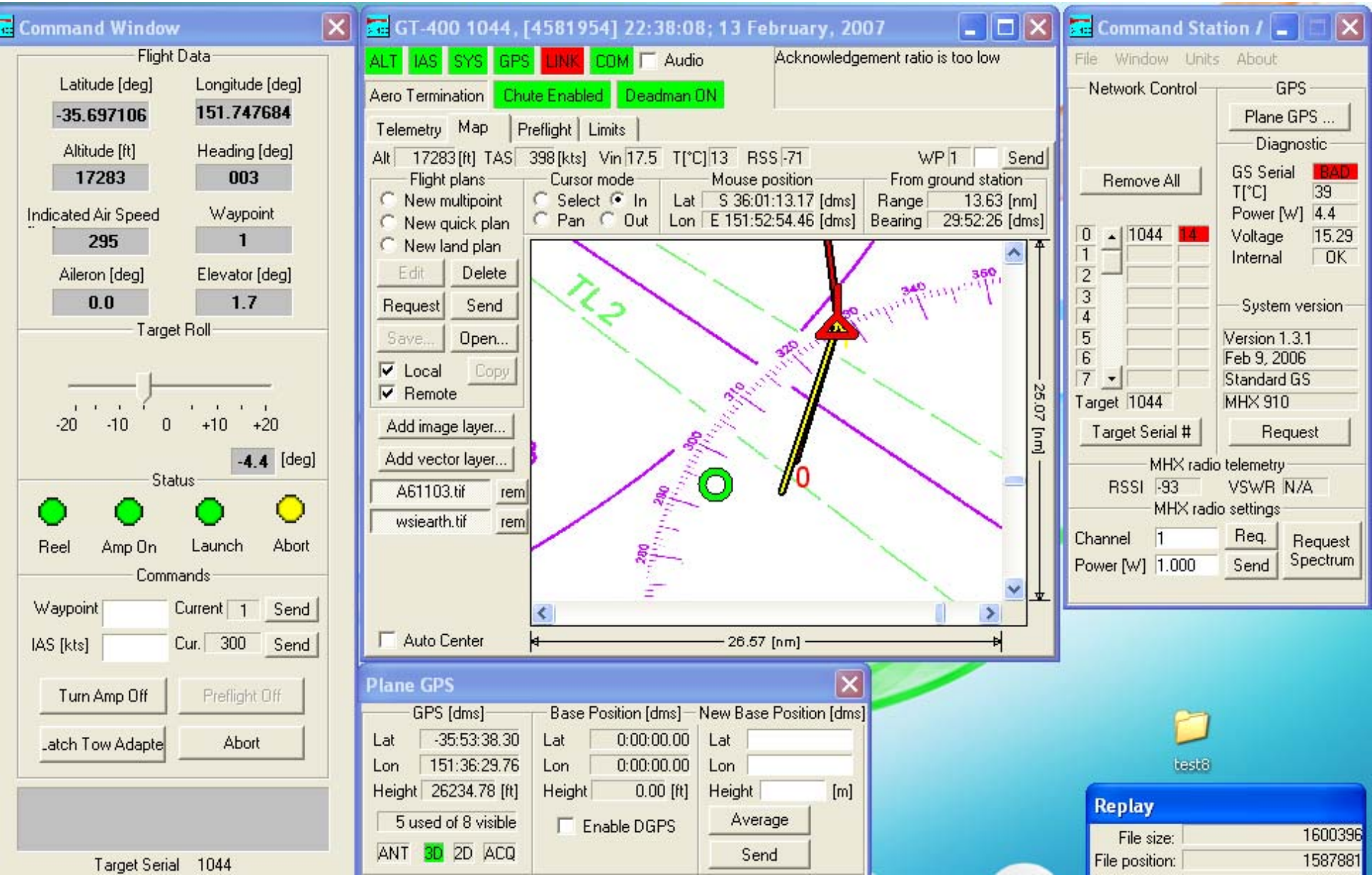
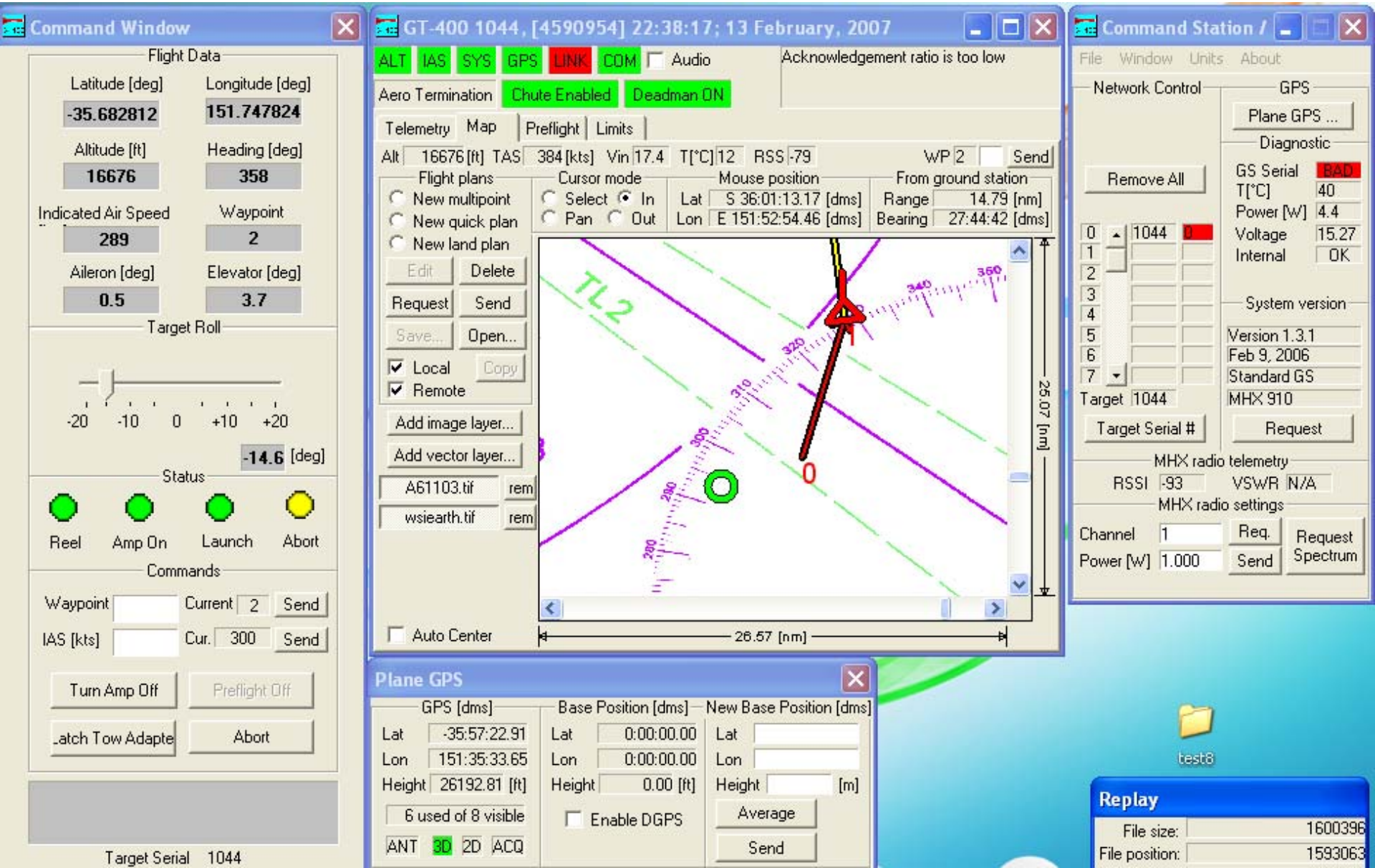
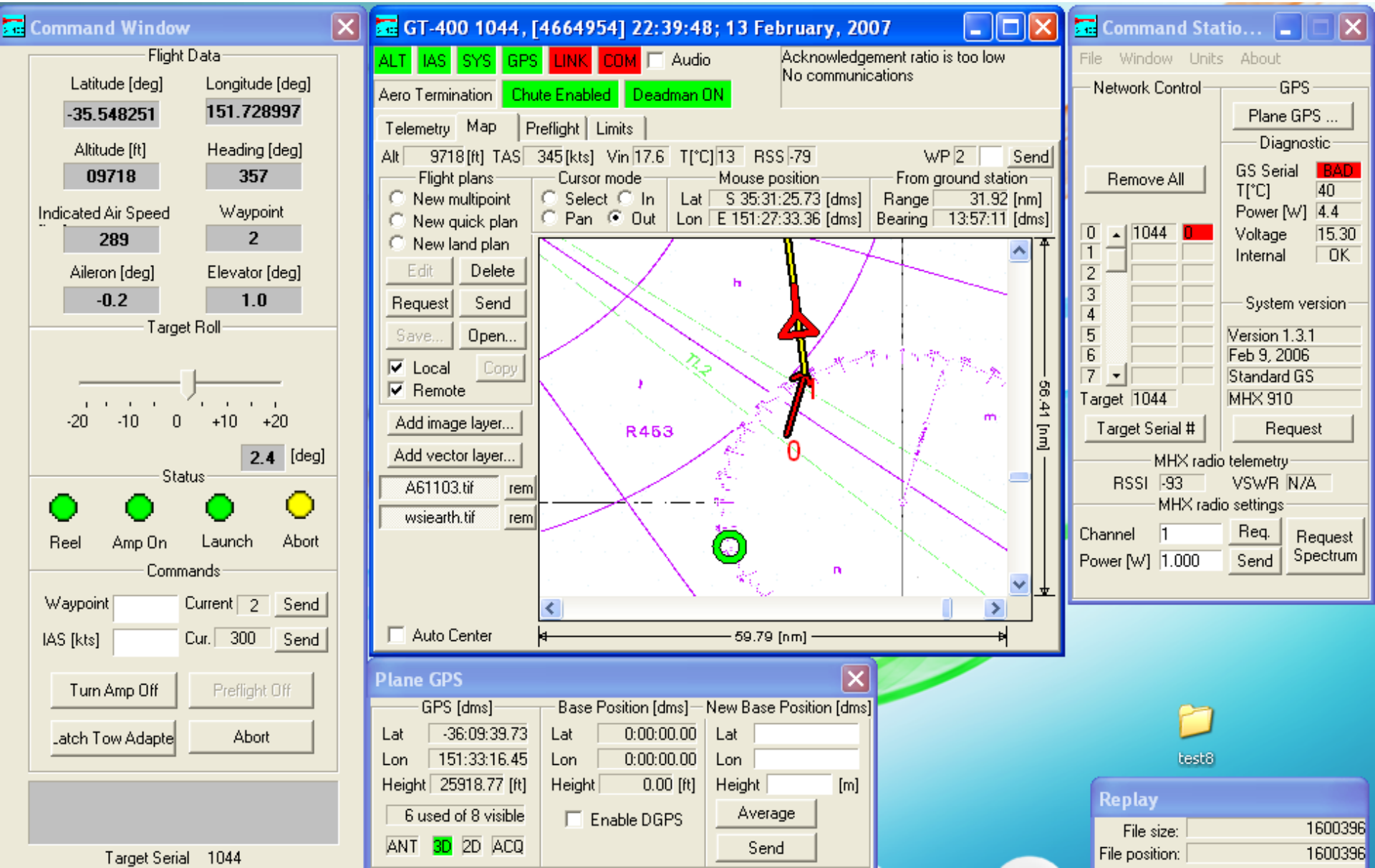

Command Window
Flight Data
Latitude [deg]
-35.697106
Longitude [deg]
151.747684
Altitude [ft]
17283
Heading [deg]
003
Indicated Air Speed
295
Waypoint
1
Aileron [deg]
0.0
Elevator [deg]
1.7
Target Roll
-20 -10 0 +10 +20
-4.4 [deg]
Status
Reel
Amp On
Launch
Abort
Commands
Waypoint
Current 1 Send
IAS [kts]
Cur. 300 Send
Turn Amp Off
Preflight Off
Latch Tow Adapte
Abort
Target Serial 1044
GT-400 1044, [4581954] 22:38:08; 13 February, 2007
ALT IAS SYS GPS LINK COM Audio
Acknowledgement ratio is too low
Aero Termination
Chute Enabled
Deadman ON
Telemetry Map Preflight Limits
Alt 17283 [ft] TAS 398 [kts] Vin 17.5 T[°C] 13 RSS -71
WP 1 Send
Flight plans
New multipoint
New quick plan
New land plan
Edit Delete
Request Send
Save... Open...
Local Copy
Remote
Add image layer...
Add vector layer...
A61103.tif rem
wsiearth.tif rem
Cursor mode
Select In
Pan Out
Mouse position
Lat S 36:01:13.17 [dms]
Lon E 151:52:54.46 [dms]
From ground station
Range 13.63 [nm]
Bearing 29:52:26 [dms]
TL2
25.07 [nm]
Auto Center
26.57 [nm]
Plane GPS
GPS [dms]
Lat -35:53:38.30
Lon 151:36:29.76
Height 26234.78 [ft]
5 used of 8 visible
ANT 3D 2D ACQ
Base Position [dms]
Lat 0:00:00.00
Lon 0:00:00.00
Height 0.00 [ft]
Enable DGPS
New Base Position [dms]
Lat
Lon
Height [m]
Average
Send
Command Station /
File Window Units About
Network Control
Remove All
0 1044 14
Target 1044
Target Serial #
GPS
Plane GPS ...
Diagnostic
GS Serial BAD
T[°C] 39
Power [W] 4.4
Voltage 15.29
Internal OK
System version
Version 1.3.1
Feb 9, 2006
Standard GS
MHX 910
Request
MHX radio telemetry
RSSI -93 VSWR N/A
MHX radio settings
Channel 1 Req.
Power [W] 1.000 Send
Request Spectrum
test8
Replay
File size: 1600396
File position: 1587881


Command Window
Flight Data
Latitude [deg]
-35.682812
Longitude [deg]
151.747824
Altitude [ft]
16676
Heading [deg]
358
Indicated Air Speed
289
Waypoint
2
Aileron [deg]
0.5
Elevator [deg]
3.7
Target Roll
-20 -10 0 +10 +20
-14.6 [deg]
Status
Reel
Amp On
Launch
Abort
Commands
Waypoint
Current 2 Send
IAS [kts]
Cur. 300 Send
Turn Amp Off
Preflight Off
Latch Tow Adapte
Abort
Target Serial 1044
GT-400 1044, [4590954] 22:38:17; 13 February, 2007
ALT IAS SYS GPS LINK COM Audio
Acknowledgement ratio is too low
Aero Termination
Chute Enabled
Deadman ON
Telemetry Map Preflight Limits
Alt 16676 [ft] TAS 384 [kts] Vin 17.4 T[°C] 12 RSS -79
WP 2 Send
Flight plans
New multipoint
New quick plan
New land plan
Edit Delete
Request Send
Save... Open...
Local Copy
Remote
Add image layer...
Add vector layer...
A61103.tif rem
wsiearth.tif rem
Cursor mode
Select In
Pan Out
Mouse position
Lat S 36:01:13.17 [dms]
Lon E 151:52:54.46 [dms]
From ground station
Range 14.79 [nm]
Bearing 27:44:42 [dms]
TL2
25.07 [nm]
Auto Center
26.57 [nm]
Plane GPS
GPS [dms]
Lat -35:57:22.91
Lon 151:35:33.65
Height 26192.81 [ft]
6 used of 8 visible
ANT 3D 2D ACQ
Base Position [dms]
Lat 0:00:00.00
Lon 0:00:00.00
Height 0.00 [ft]
Enable DGPS
New Base Position [dms]
Lat
Lon
Height [m]
Average
Send
Command Station /
File Window Units About
Network Control
Remove All
Target 1044
Target Serial #
GPS
Plane GPS ...
Diagnostic
GS Serial BAD
T[°C] 40
Power [W] 4.4
Voltage 15.27
Internal OK
System version
Version 1.3.1
Feb 9, 2006
Standard GS
MHX 910
Request
MHX radio telemetry
RSSI -93 VSWR N/A
MHX radio settings
Channel 1 Req.
Power [W] 1.000 Send
Request Spectrum
test8
Replay
File size: 1600396
File position: 1593063


Command Window
Flight Data
Latitude [deg]
-35.548251
Longitude [deg]
151.728997
Altitude [ft]
09718
Heading [deg]
357
Indicated Air Speed
289
Waypoint
2
Aileron [deg]
-0.2
Elevator [deg]
1.0
Target Roll
-20 -10 0 +10 +20
2.4 [deg]
Status
Reel
Amp On
Launch
Abort
Commands
Waypoint
Current 2 Send
IAS [kts]
Cur. 300 Send
Turn Amp Off
Preflight Off
Latch Tow Adapte
Abort
Target Serial 1044
GT-400 1044, [4664954] 22:39:48; 13 February, 2007
ALT IAS SYS GPS LINK COM Audio
Acknowledgement ratio is too low
No communications
Aero Termination
Chute Enabled
Deadman ON
Telemetry Map Preflight Limits
Alt 9718 [ft] TAS 345 [kts] Vin 17.6 T[°C] 13 RSS -79
WP 2 Send
Flight plans
New multipoint
New quick plan
New land plan
Edit Delete
Request Send
Save... Open...
Local Copy
Remote
Add image layer...
Add vector layer...
A61103.tif rem
wsiearth.tif rem
Cursor mode
Select In
Pan Out
Mouse position
Lat S 35:31:25.73 [dms]
Lon E 151:27:33.36 [dms]
From ground station
Range 31.92 [nm]
Bearing 13:57:11 [dms]
R463
56.41 [nm]
Auto Center
59.79 [nm]
Command Statio...
File Window Units About
Network Control
Remove All
0 1044 0
Target 1044
Target Serial #
GPS
Plane GPS ...
Diagnostic
GS Serial BAD
T[°C] 40
Power [W] 4.4
Voltage 15.30
Internal OK
System version
Version 1.3.1
Feb 9, 2006
Standard GS
MHX 910
Request
MHX radio telemetry
RSSI -93 VSWR N/A
MHX radio settings
Channel 1 Req.
Power [W] 1.000 Send
Request Spectrum
Plane GPS
GPS [dms]
Lat -36:09:39.73
Lon 151:33:16.45
Height 25918.77 [ft]
6 used of 8 visible
ANT 3D 2D ACQ
Base Position [dms]
Lat 0:00:00.00
Lon 0:00:00.00
Height 0.00 [ft]
Enable DGPS
New Base Position [dms]
Lat
Lon
Height [m]
Average
Send
test8
Replay
File size: 1600396
File position: 1600396

Air Force Flight Test Center

War-Winning Capabilities … On Time, On Cost

How Today's Complexity Drives Future Range Requirements

Brigadier General David J. Eichhorn
AFFTC Commander

30 Oct 2007

This Briefing is:
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Integrity - Service - Excellence

Future Range Requirements

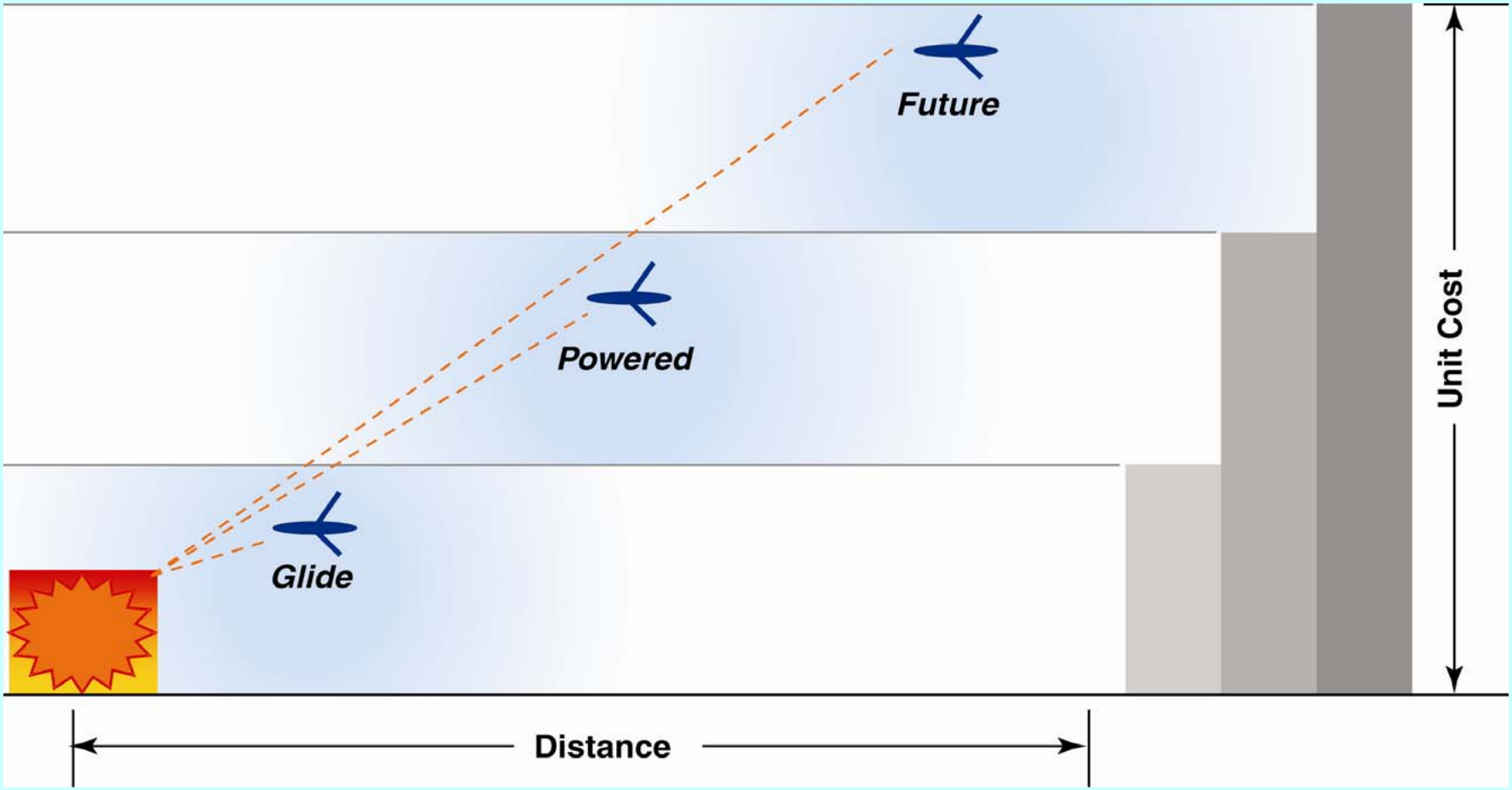
- Cost and complexity are increasing
- Funding is decreasing
- Range constraints are increasing

Facing Changes

- B-52 with CALCM
- F-15 with LRSOW
- B-2 with SDBs
- Directed Energy
- Hypersonic

Trends

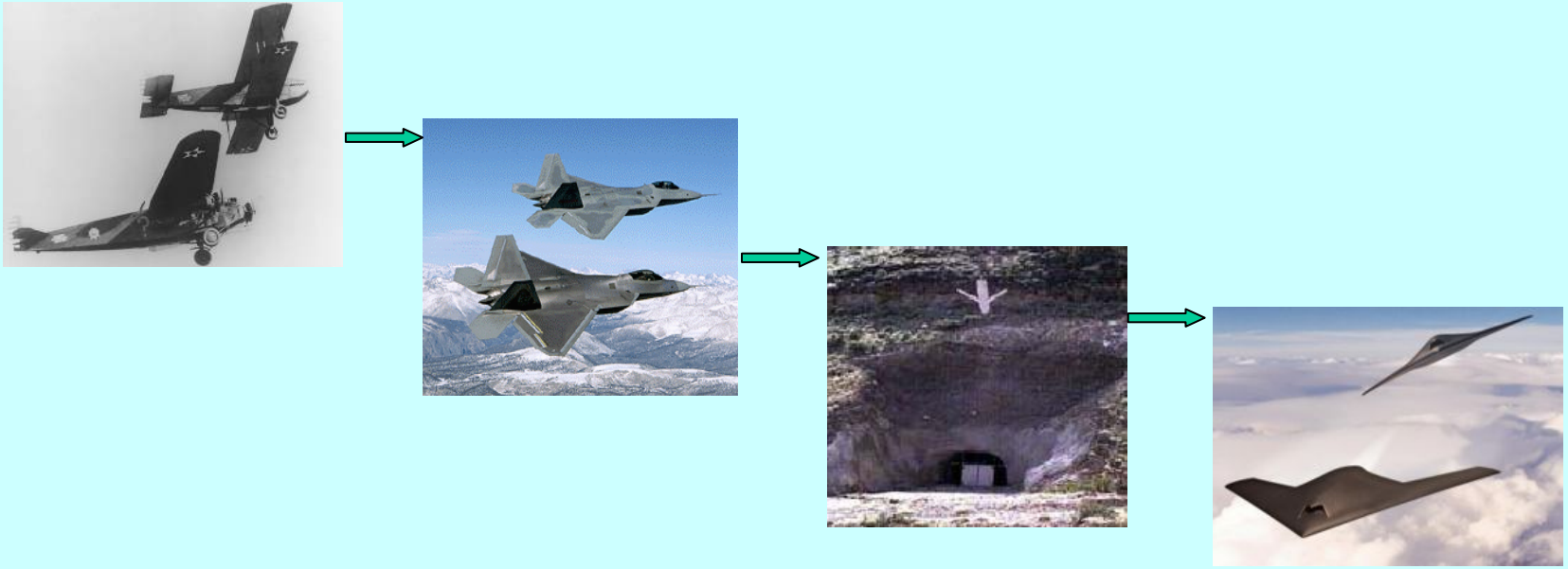
Gravity	Glide	Powered
GBU	LONGSHOT	TOMAHAWK
CBU	JSOW	JASSM
WCMD	SDB	JDRADM
JDAM		



Complexity of Weapons Tests

Test and Training Challenges

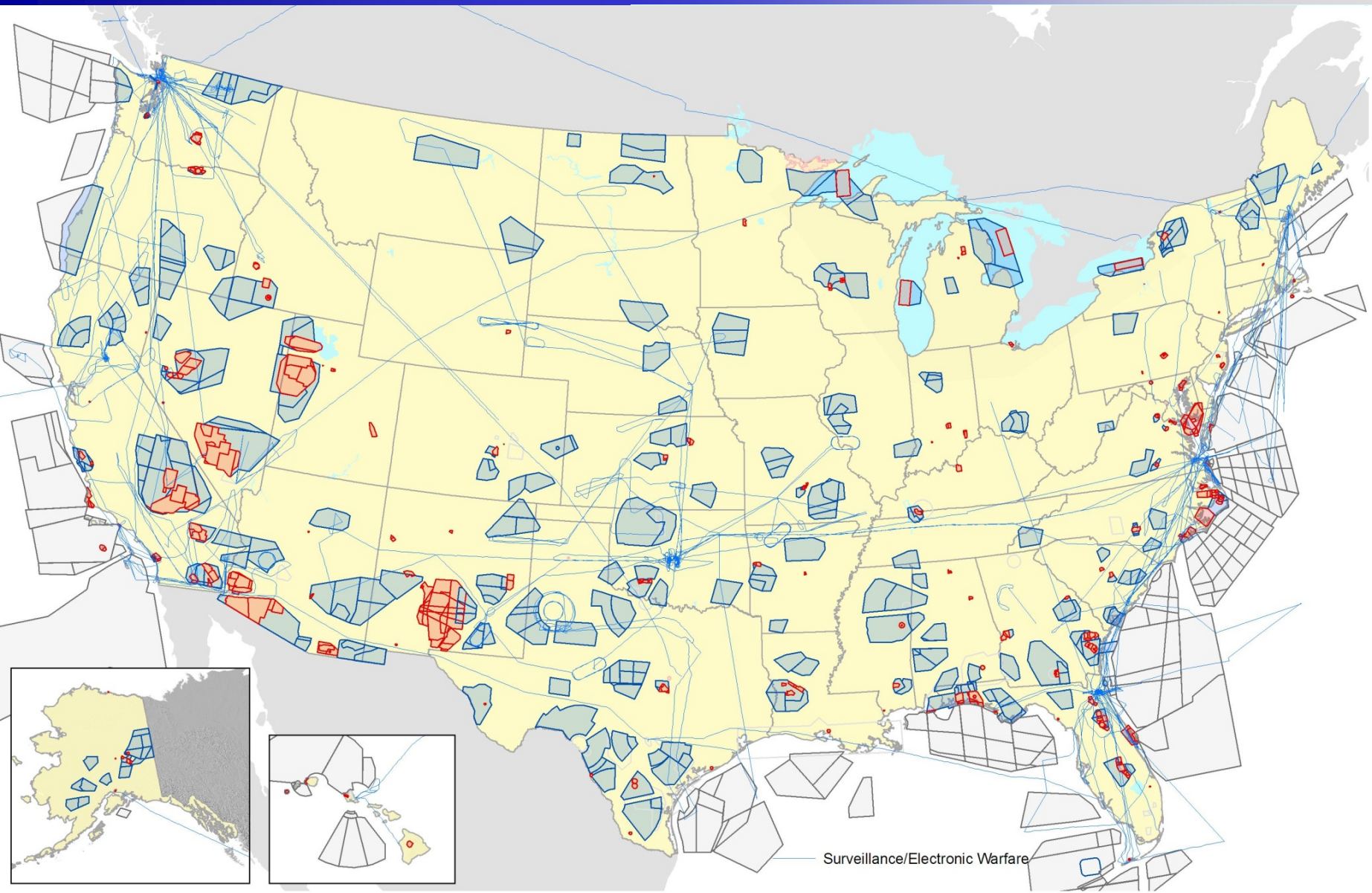
- Resource contention
- Aging fleet
- Mission priorities
- Complexity



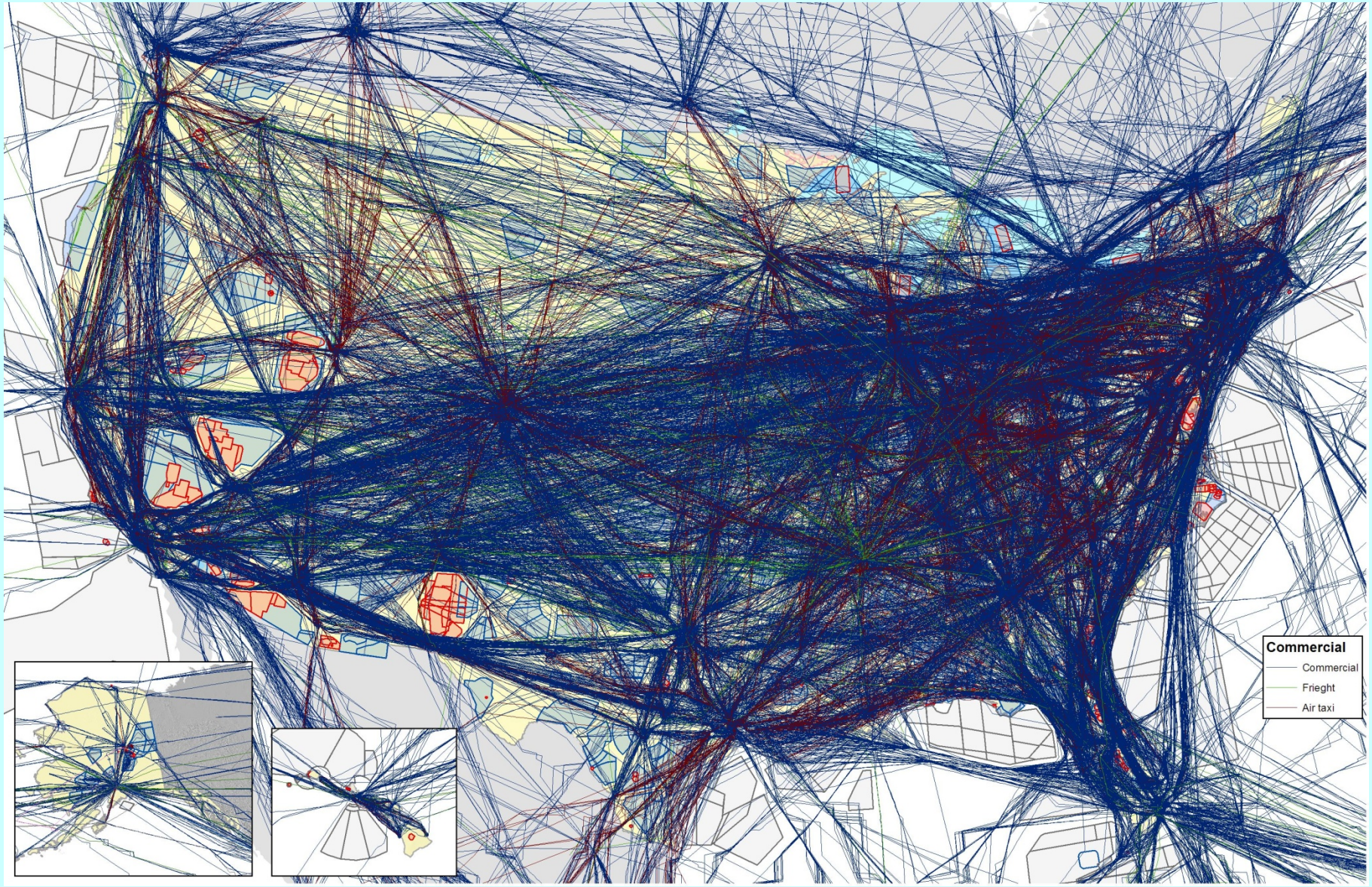
Test Ranges Need

- Airspace distance over land
- Restricted use for safety and security
- Network capabilities and bandwidth
- Infrastructure

Ranges Today



Range Constraints Today



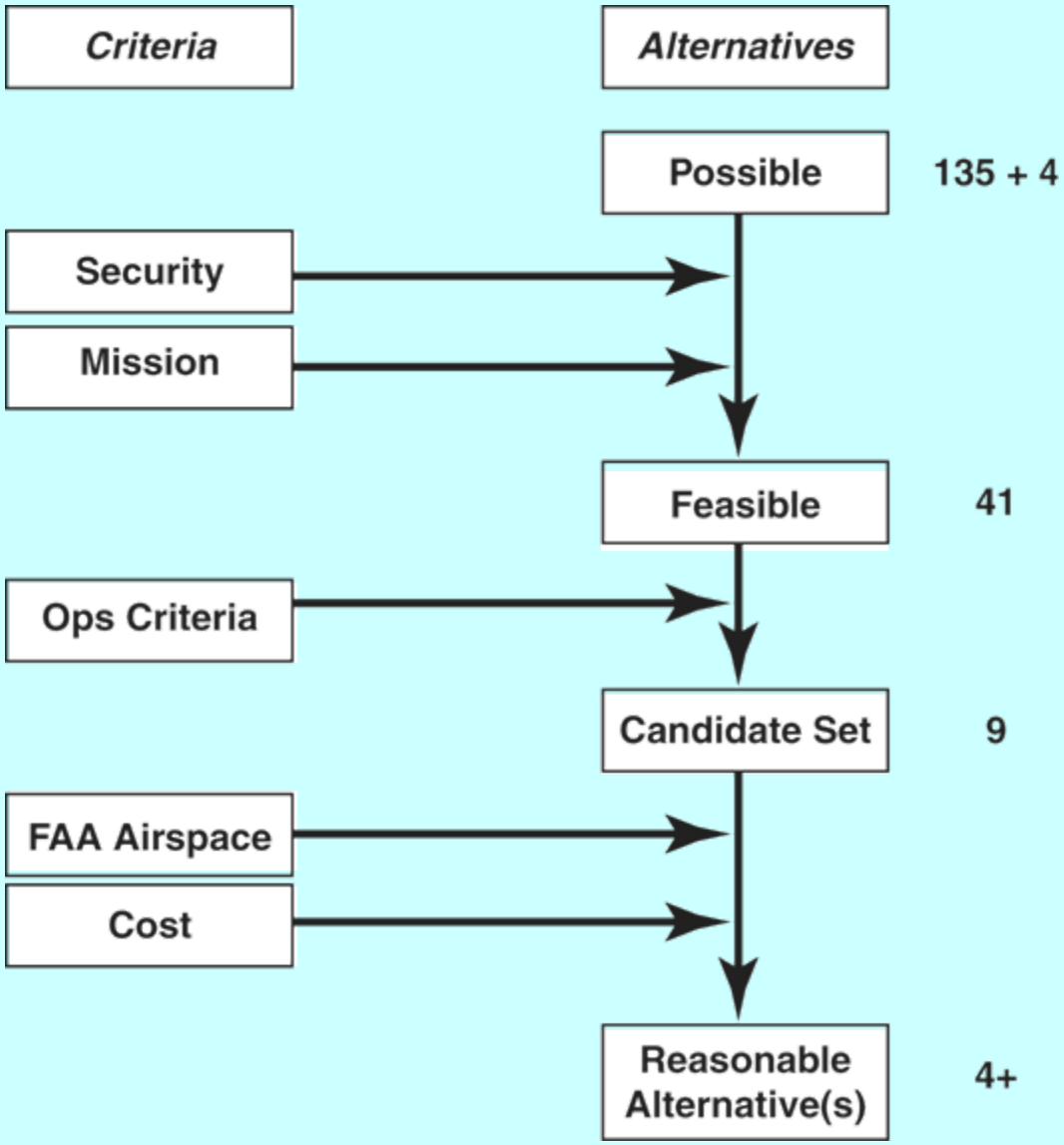
Other Constraints on Today's Testing

Environmental

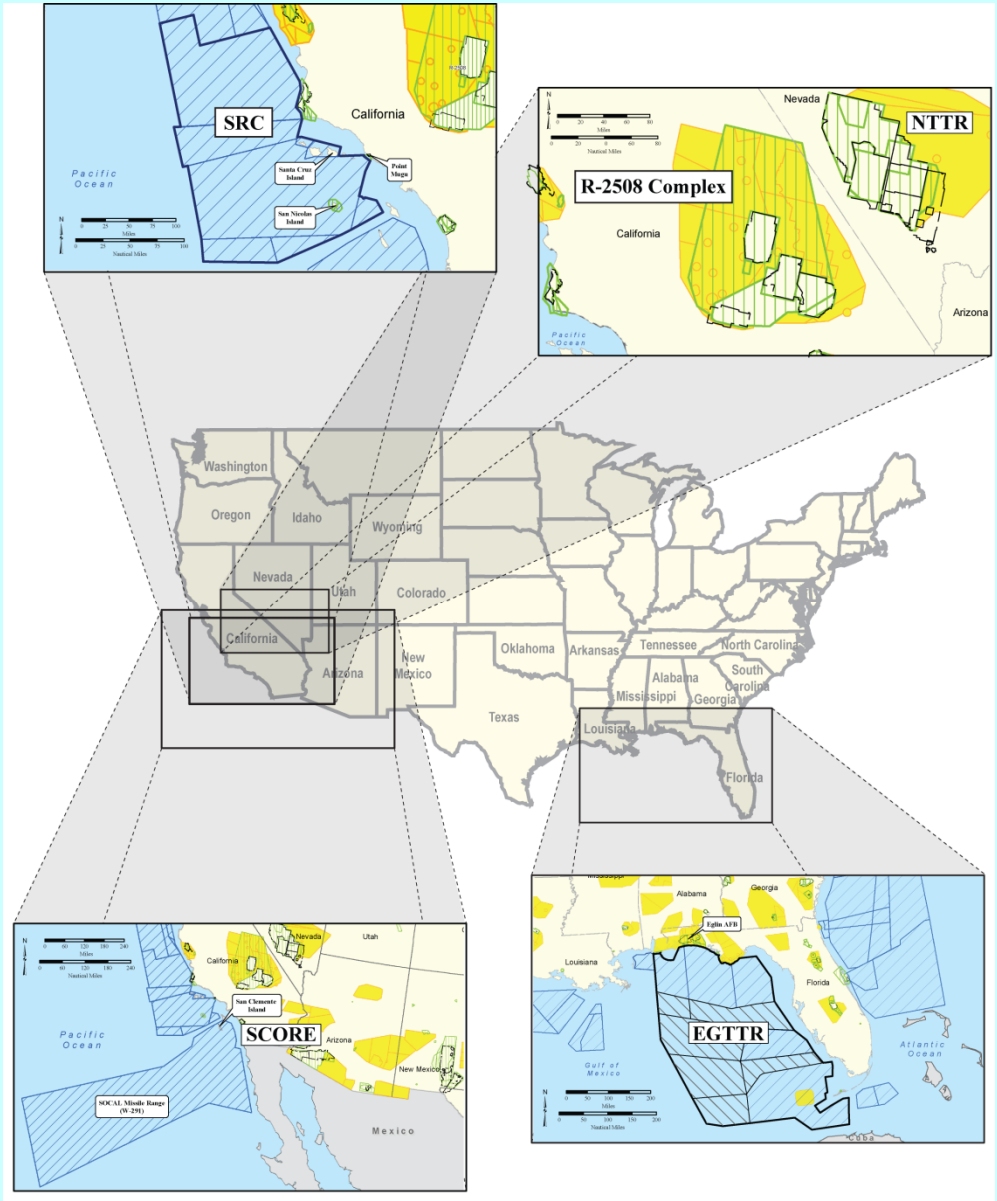
Commercial Airspace

Population Encroachment

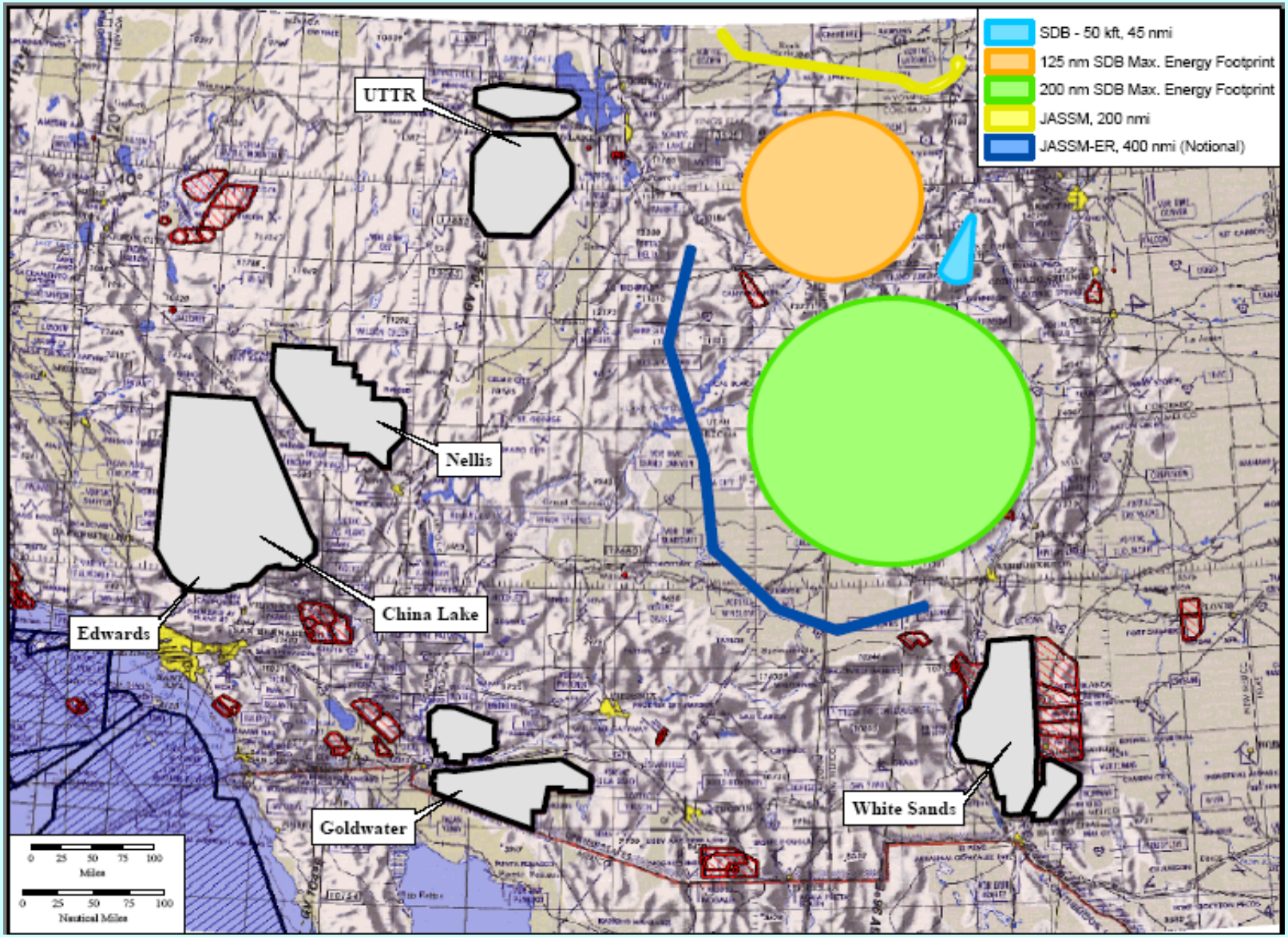
Finding Ranges for Testing



Finding Ranges for Testing

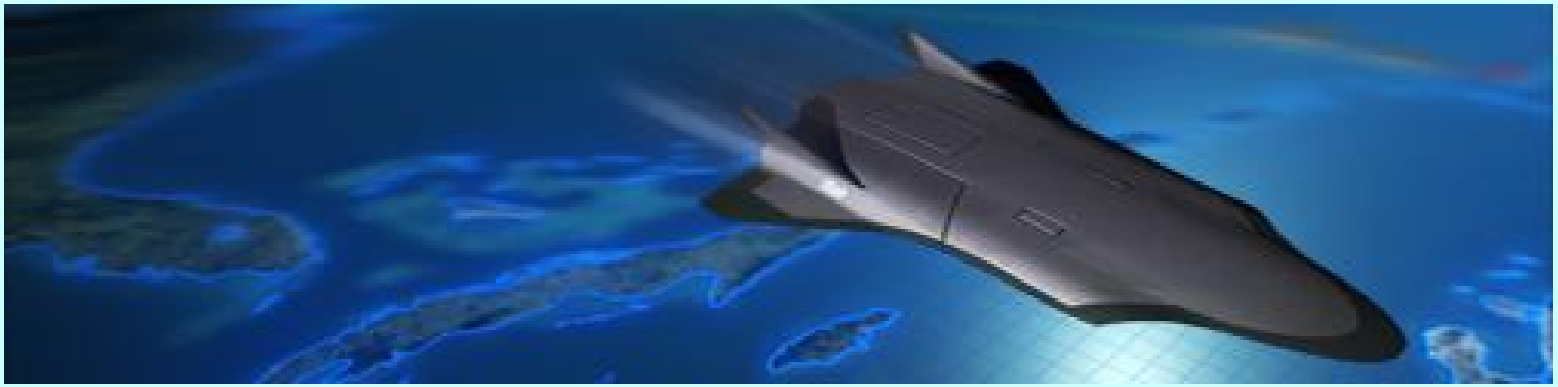


Considerations



Current Hypersonic Projects

- **Test Planning underway**
  - **X-37B Orbital Test Vehicle**
    - **Land at VAFB, EAFB Backup - 2008**
  - **X-51A Scramjet Demo Vehicle (Mach 5)**
    - **B-52 Launch, Pt Mugu, ocean impact - 2009**
  - **FALCON Blackswift Study (Mach 6)**
    - **Horizontal takeoff and landing – 2011**
  - **Future Responsive Access to Space Technologies (FAST) - 2012**



Range Safety

- **Public safety responsibility rests with the Range Commander**
- **Safety guidelines set by Range Commander**
- **Requires vehicle situation awareness from two independent sources during total trajectory**
- **Flight termination system must be independent of aircraft systems**
- **Required for all non-piloted UAVs**

Range

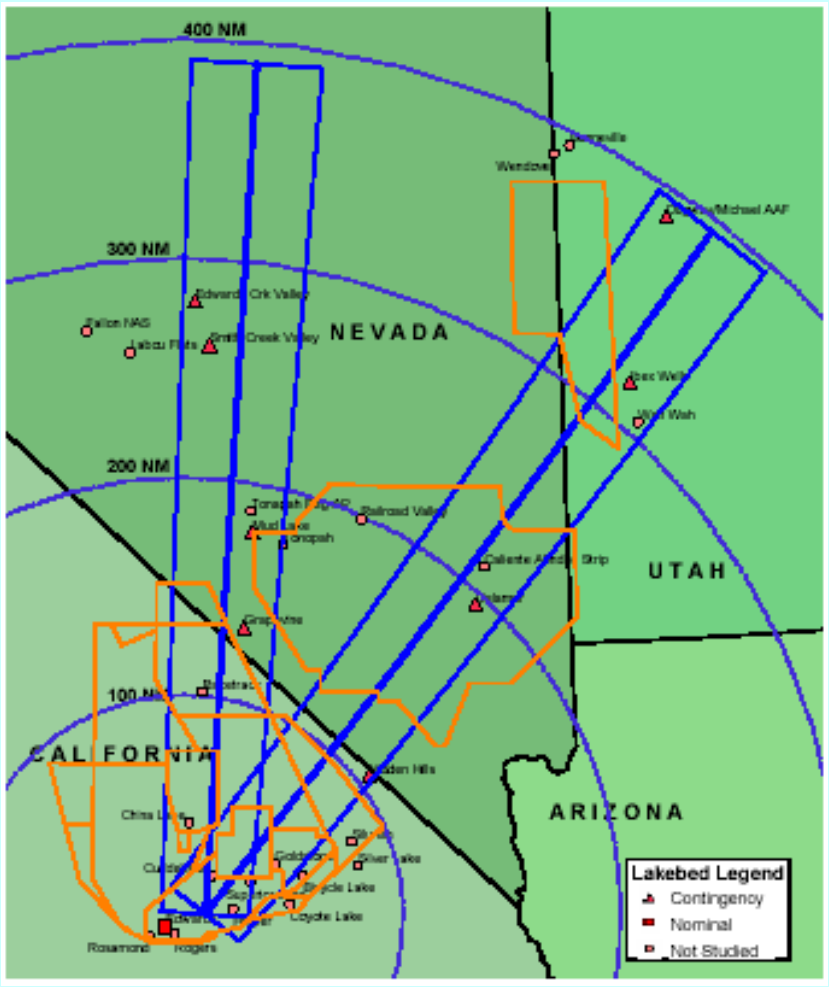
- **Where to fly driven by vehicle type**
  - **Reentry vehicle landing established by manned Space Shuttle**
  - **Air-Launched vehicle – can be launched required distance from landing site**
  - **Non-recoverable – can be launch over ocean**
    - **Suffers lost ability to inspect or refly**
    - **Programs are now defining need to recover**
  - **Horizontal or vertical takeoff and landing is the challenge**
    - **Vehicle must fit the takeoff and landing sites available AND with acceptable corridors**
    - **Data Acquisition sites must be located to support all potential trajectories to support data collection and continuous situation awareness for Range safety**

EA Process

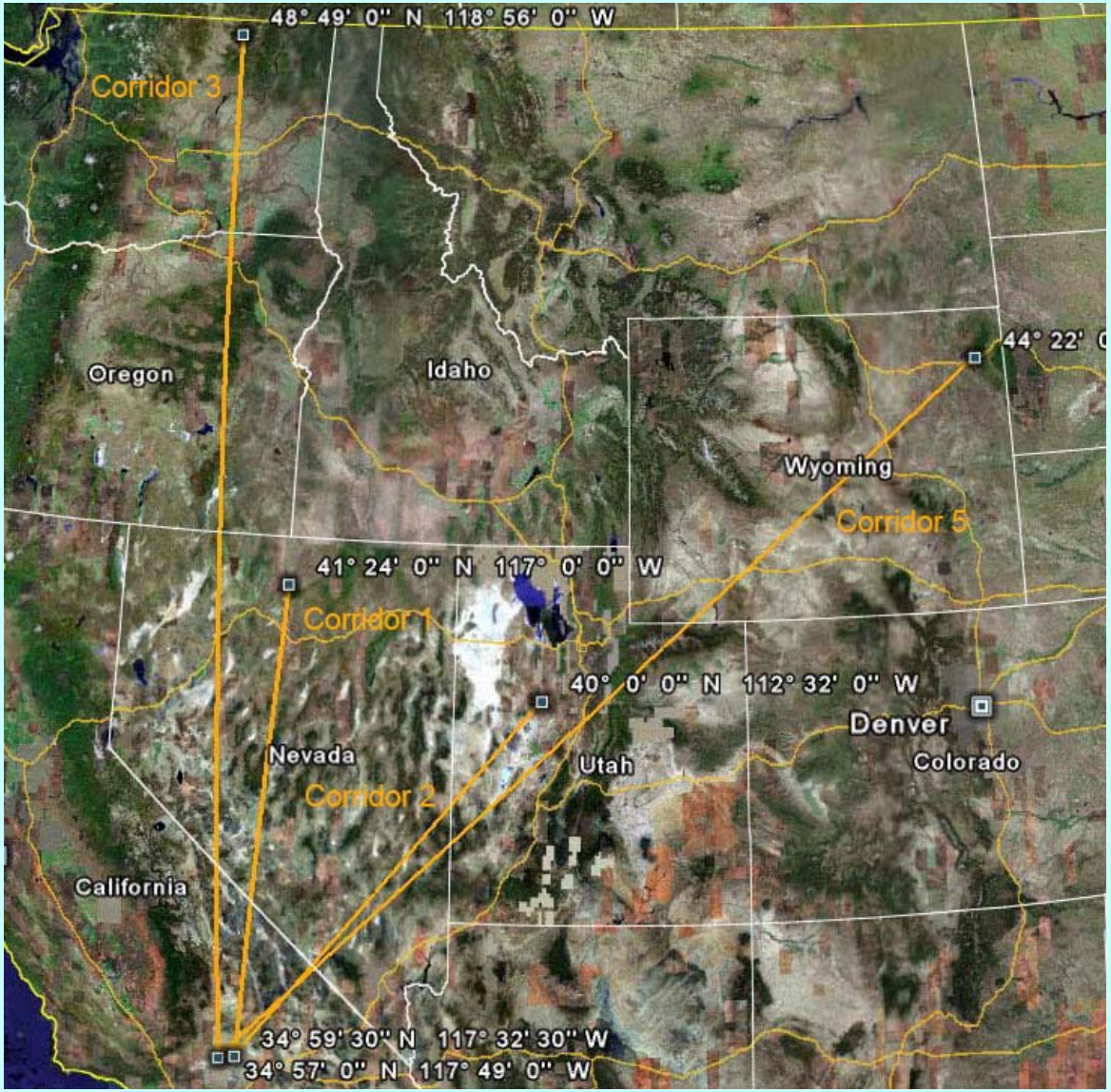
- Requires vehicle characteristics and trajectories, including envelope expansion
- First product is the Quantitative Risk Assessment to determine range safety acceptability
- Other analysis required for:
  - Sonic booms, commercial air traffic, impact to ground test sites, etc
- EA can cost $500k and take 2 years
- Test Range pre-defining and conducting initial EAs for assumed configurations can reduce time and cost to specific projects

EAFB Hypersonic Test Corridors

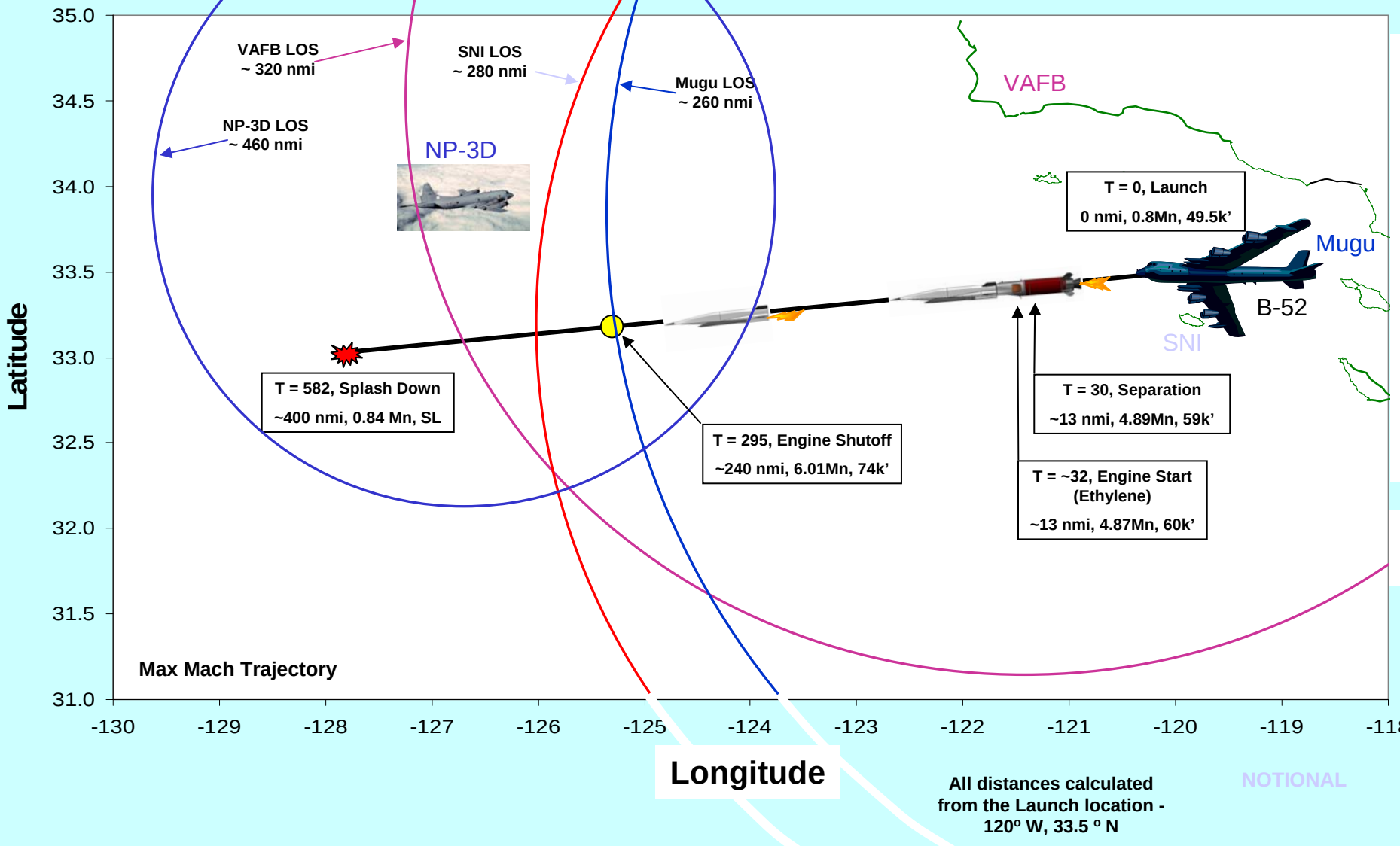
- Mach 8 Air-Launched Research Vehicles
  - 400 nm Risk Assessment Completed
  - 825 nm Risk Assessment in work



EAFB Hypersonic Test Corridors



X-51 Mission – Pt Mugu



All distances calculated from the Launch location - 120° W, 33.5 ° N

NOTIONAL

Future Range Needs

Test Components	*Operational*	*End-to-End*	*Range Support*	*Connectivity*
Ideal	**Test and Training**	**Airspace and ground exclusive test use**	**Support all tests all the time**	**End to End all parameters**
Reality	**Test or Training**	**Limited restricted use airspace and range**	**Priorities and support**	**Priorities and pick parameters and through-put**

Examples of Ongoing and Future Coordination

- Meeting expanded airspace test requirements
  - Work with civil aviation
  - Narrow test schedule requirements
- Improve confidence in tests
  - Proven Flight Termination System
  - Test components to improve trust in combined system
  - Identify locations with reduced potential for impacts
- Reduce competition for Range time
  - Coordinate training and test scheduling
- Improve testing
  - Improve test methodology and tools

What next?

- **Develop flexible mobile test infrastructure for deployment to different test locations**
- **Test at varied locations**
  - **Some currently used**
  - **Some joint agency**
  - **Some historically not used for tests**
- **Government, industry, and the public must work together to meet test requirements**

Complexity Drives Future Ranges

- Complexity will only increase
- One-stop shopping for all tests is unrealistic
- Weapons systems costs will drive test and training
- Safety will continue to be number one requirement
- Testing and training ranges face multiple complex constraints
- Future Range requirements will be met by coordination and flexibility

Headquarters Air Combat Command

JSF Range & Airspace Requirements

Maj “Digger” Davis
HQ ACC/A8F
30 Oct 2007

This Briefing is:
UNCLASSIFIED

Overview

- JSF Program Update
- JSF “Family” of Aircraft
- JSF Operations
- Integrated Avionics Suite
  - Surface Target ID
  - AESA Radar
  - EOTS
  - DAS
- Range Criteria
- Summary

JSF "101"

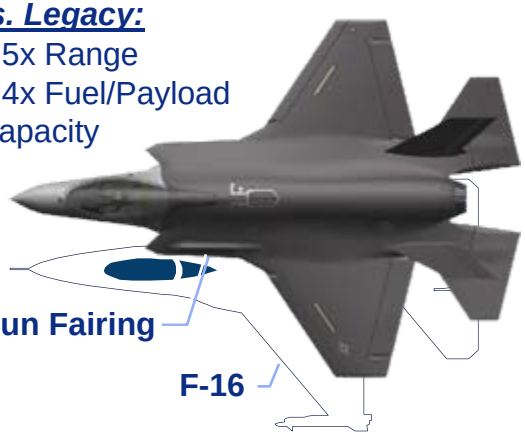
- USAF, USN, USMC, and several other countries will be fielding JSF
  - Single seat, multi-role fighter
- Three Variants
  - USAF Conventional Take Off and Landing (CTOL)
  - USMC Short Take Off/Vertical Land (STOVL)
  - USN Carrier Variant (CV)
- USAF purchase is for 1763 aircraft
  - 1-for-1 replacement for A-10/F-16
- JSF will enter USAF inventory ~2010
  - IOC ~2013

JSF Family of Aircraft

CTOL

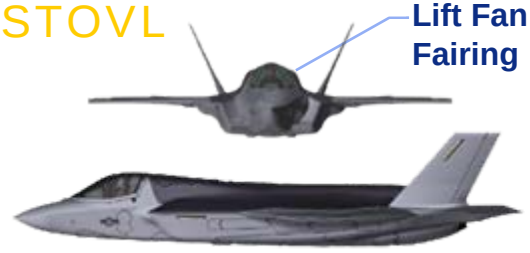
Span (ft)	35
Length (ft)	50.5
Wing Area (ft^2)	460

vs. Legacy:
2.5x Range
1.4x Fuel/Payload Capacity



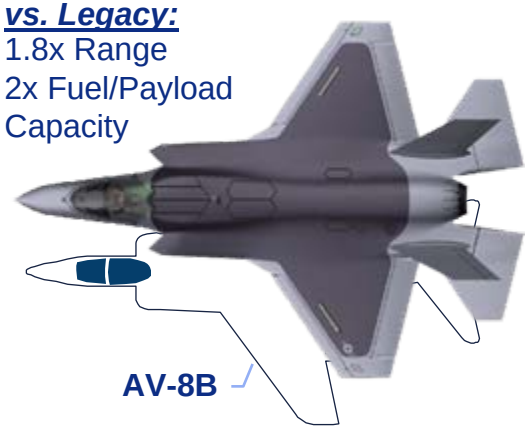
Weight Empty (lb)	**26,664**
Internal Fuel (lb)	**18,307**

STOVL



Span (ft)	35
Length (ft)	50.5
Wing Area (ft^2)	460

vs. Legacy:
1.8x Range
2x Fuel/Payload Capacity

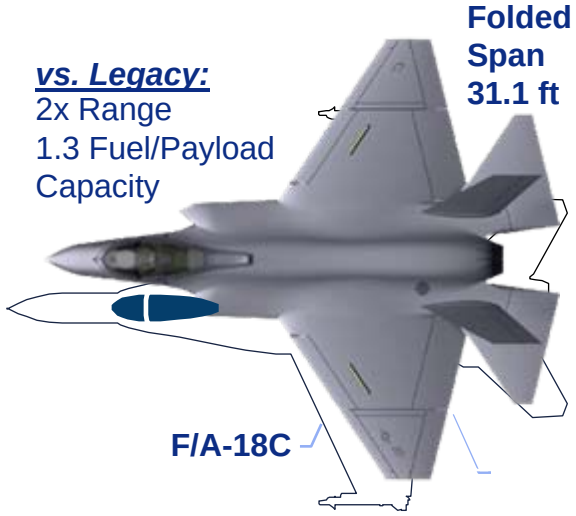


Weight Empty (lb)	**29,695**
Internal Fuel (lb)	**13,400**

CV

Span (ft)	43
Length (ft)	50.8
Wing Area (ft^2)	620

vs. Legacy:
2x Range
1.3 Fuel/Payload Capacity



Weight Empty (lb)	**29,996**
Internal Fuel (lb)	**19,145**

AA-1 in Flight Test

- First Flight was 15 Dec 2006

Status

- 19 flights to date (six in January)
- Plan is 6 flights a month
- Next flight scheduled late Nov 07

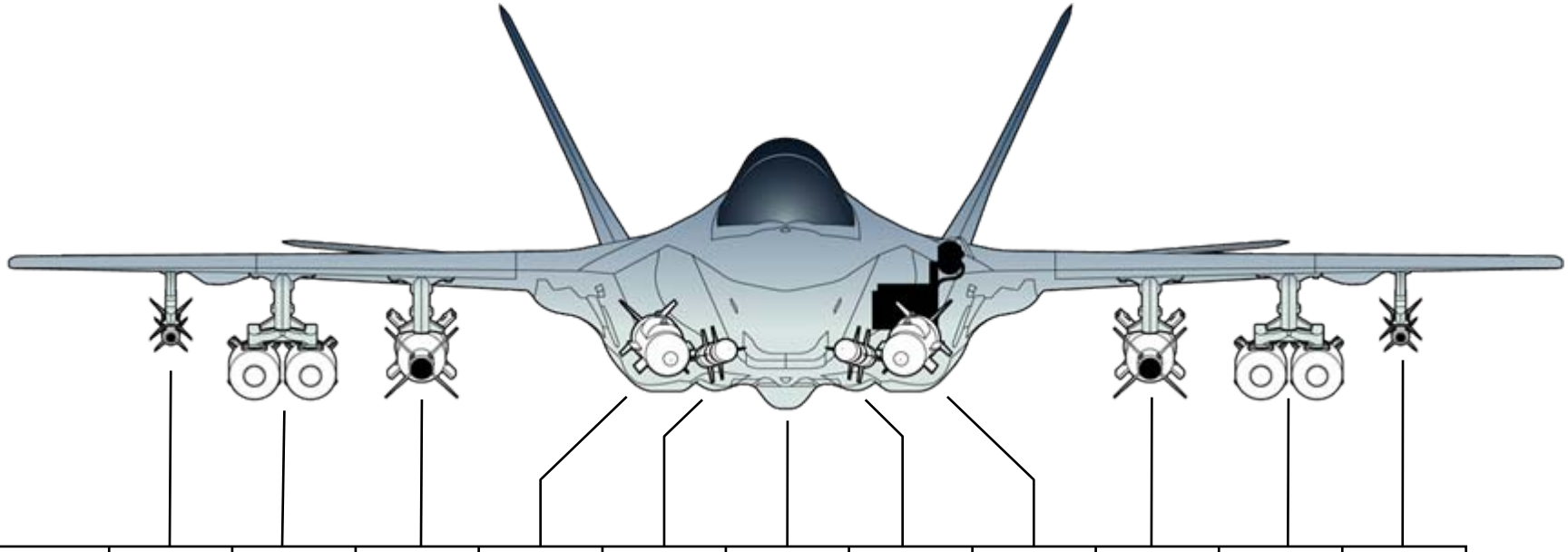
Objectives

- Risk reduction/confirmation
- Basic envelope expansion
- Systems integration

JSF Operations

- **JSF will be F-18/F-16-like**
  - **60/40 mix – not built for the "phone booth"**
  - **Sensor Management/Integration intensive**
- **Active Electronically Scanned Array (AESA) Radar much more capable than legacy**
  - **Tactics require larger amounts of airspace to train realistically**
  - **Legacy fighters are also being upgraded with AESA**
- **"Normal" operating altitudes will be in FL300-FL400**
  - **Does not preclude low/medium altitude training requirements**
- **"Embedded Training" will change range requirements**
  - **Strafe only, occasional LGB/J-Series weapons delivery**
  - **Will require very high fidelity targets for Combat ID**

Weapons Carriage Capability



Station	11	10	9	8	7	6	5	4	3	2	1
Store	A/A	A/A, A/S	A/A, A/S	A/A, A/S	A/A	A/S	A/A	A/A, A/S	A/A, A/S	A/A, A/S	A/A
Weight	300	2,500	5,000	2,500	350	1,000 *	350	2,500	5,000	2,500	300

1000# STOVL

1000# STOVL

1000# STOVL

1000# STOVL

* Growth option for CTOL

Stores Fully Certified During SDD

Store Fully Certified During SDD

EXTERNAL WEAPONS


426 -Gallon Wing Tank


Stormshadow


GBU-38 JDAM 500-lb
(MK-82 Warhead)

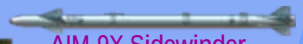

AGM-158 JASSM


MXU-648/CNU-88 Baggage Pod


AGM-154A/C JSOW Glide Bomb


AIM-120B/C AMRAAM

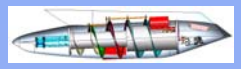

GBU-31 JDAM 2,000-lb
(MK-84 Warhead)


AIM-9X Sidewinder


GBU-32 JDAM 1,000-lb
(MK-83/BLU-110 Warhead)


BDU-57/58/60
Laser-Guided Training Round


GBU-31 JDAM 2,000-lb
(BLU-109 Warhead)


Missionized Gun


Brimstone/Joint
Common Missile

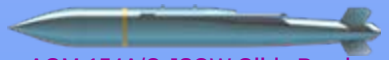
MK-76/MK-58/BDU-48

INTERNAL


GBU-32 JDAM 1,000-lb
(MK-83/BLU-110 Warhead)


GBU-12 Paveway II 500-lb LGB
(MK-82 Warhead)


GBU-31 JDAM 2,000-lb
(MK-84 Warhead)


AGM-154A/C JSOW Glide Bomb


CBU-103/104/105 WCMD


GBU-38 JDAM 500-lb
(MK-82 Warhead)


Brimstone/Joint
Common Missile


GBU-31 JDAM 2,000-lb
(BLU-109 Warhead)


AIM-120C AMRAAM


AIM-132 ASRAAM

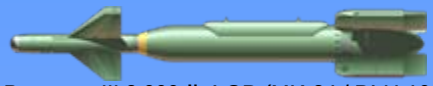
Weapons Currently Under Development

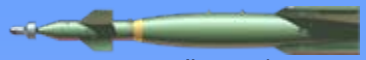

UK 500# PGB


Phase I SDB

EXTERNAL WEAPONS


GBU-10 Paveway II 2,000-lb LGB (MK-84 Warhead)


GBU-24A/B Paveway III 2,000-lb LGB (MK-84 / BLU-109 Warhead)


GBU-16 Paveway II 1,000-lb LGB (MK-83 Warhead)


MK-83 BLU-110 LDGP 1,000-lb LDGP

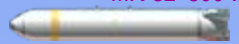

MK-83 BSU-85 HDGP


MK-84 2,000-lb LD/HDGP


MK-84 BSU-50 Ballute 2,000-lb HDGP


GBU-12 Paveway II 500-lb LGB
(MK-82 Warhead)

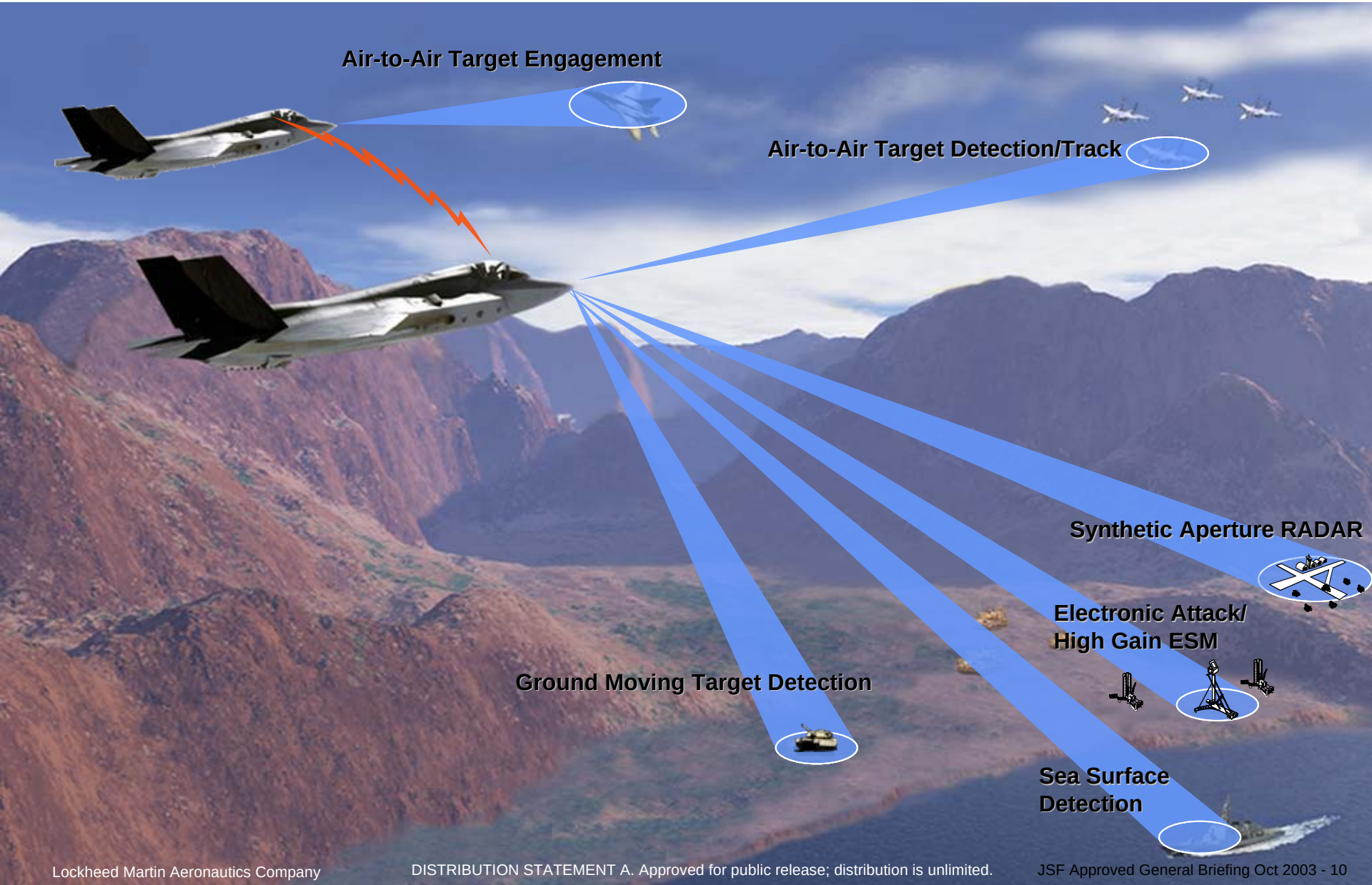

MK-82 500-lb LD & HD


CBU-99/100 Rockeye II
Cluster Munition


CBU-103/104/105 WCMD


AIM-132 ASRAAM

APG-81 Radar Advanced Electronically Scanned Array
Interleaved Search & Track

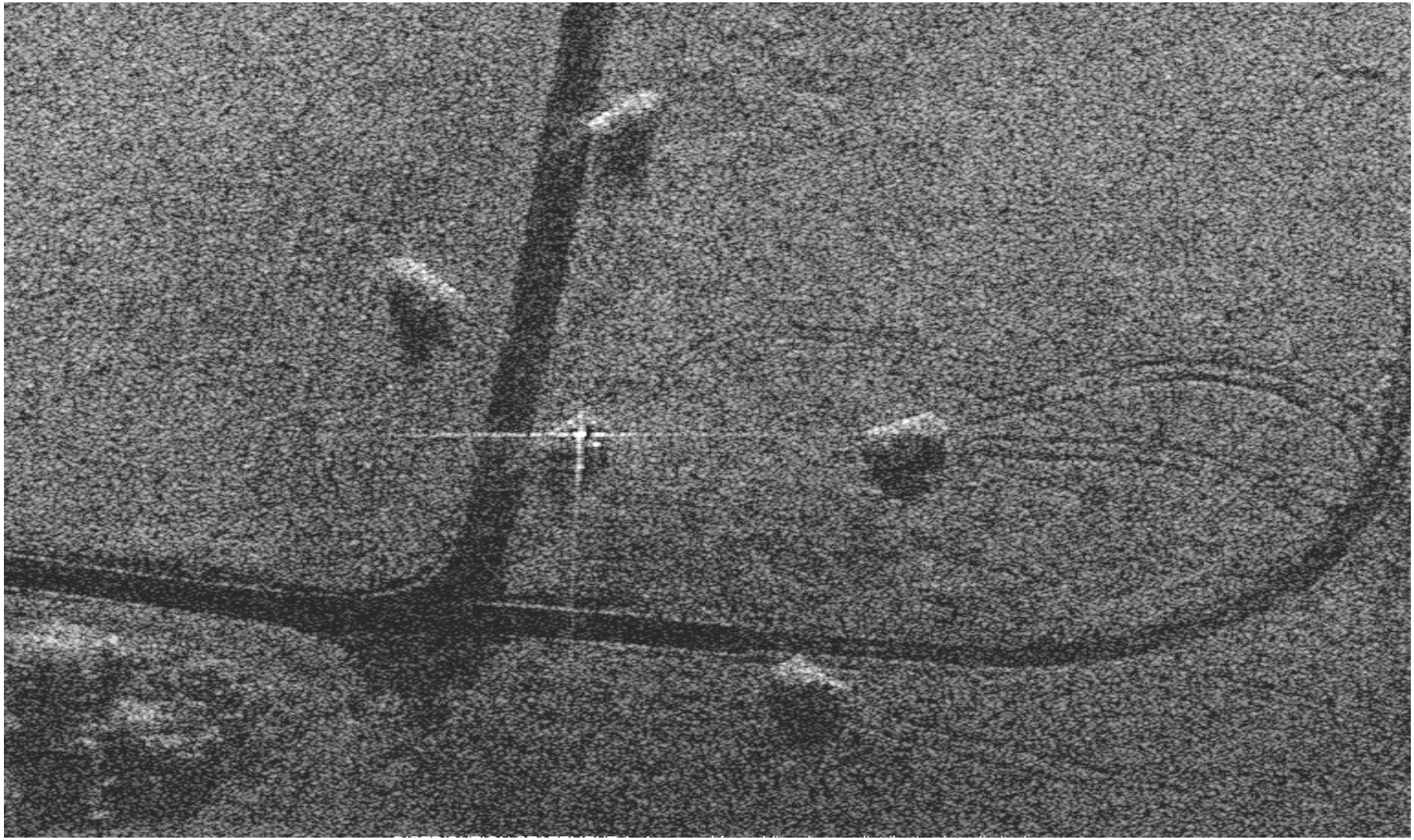


SAR Maps of NAS Patuxent River

Legacy Resolution

SAR Maps of NAS Patuxent River

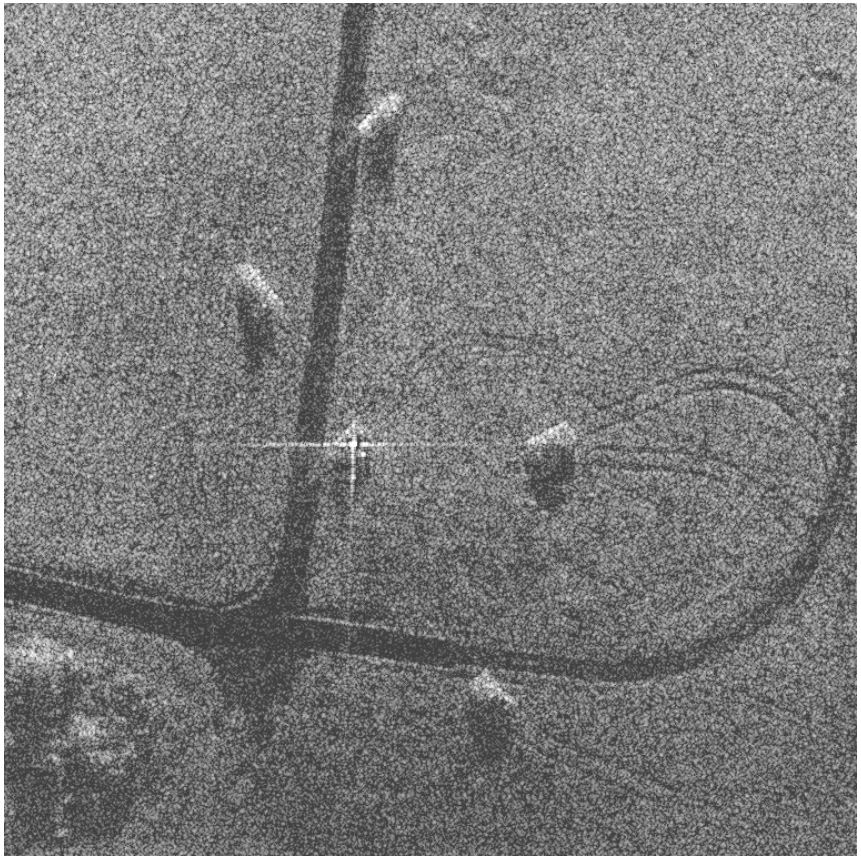
High Resolution



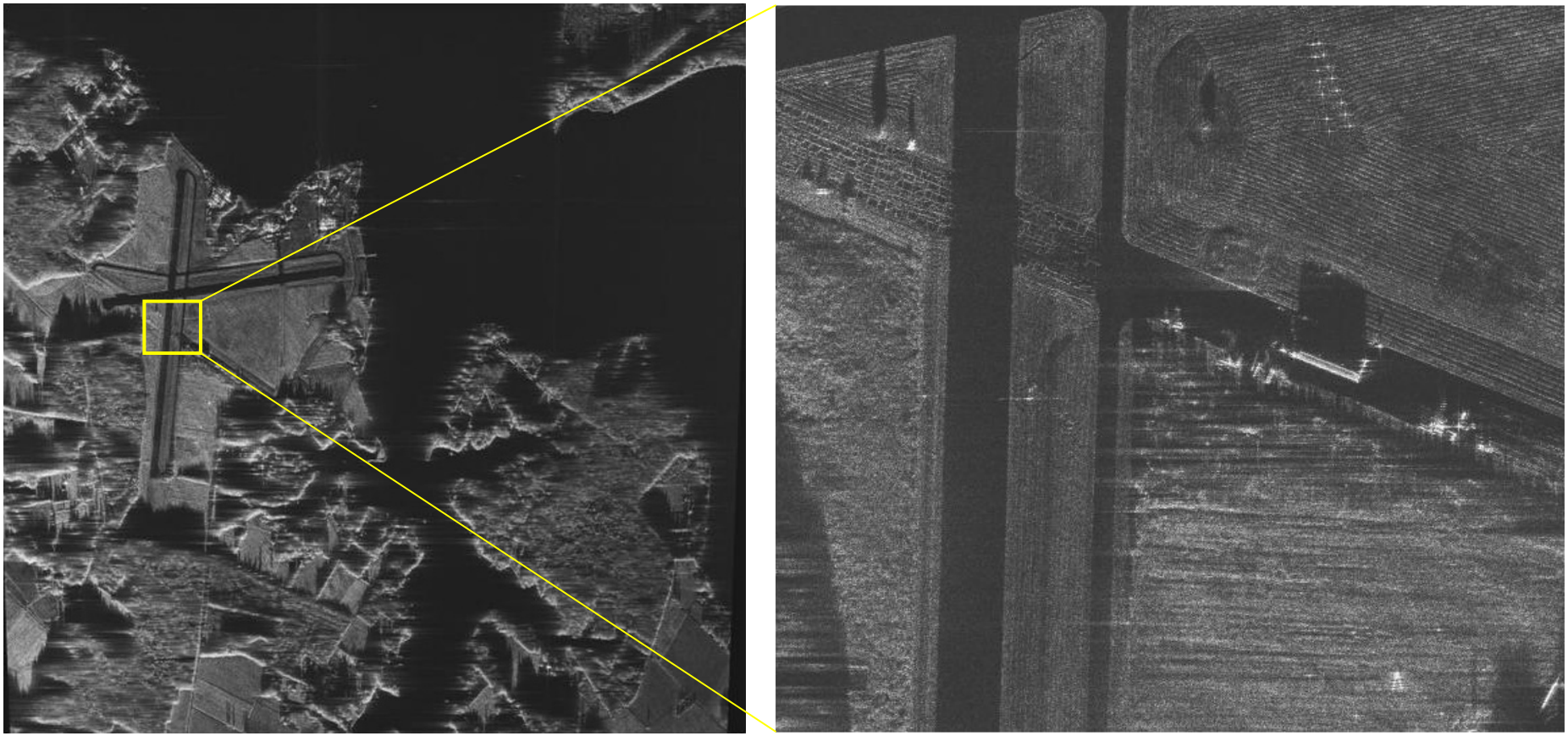
Targets at NAS Patuxent River

Legacy Capability

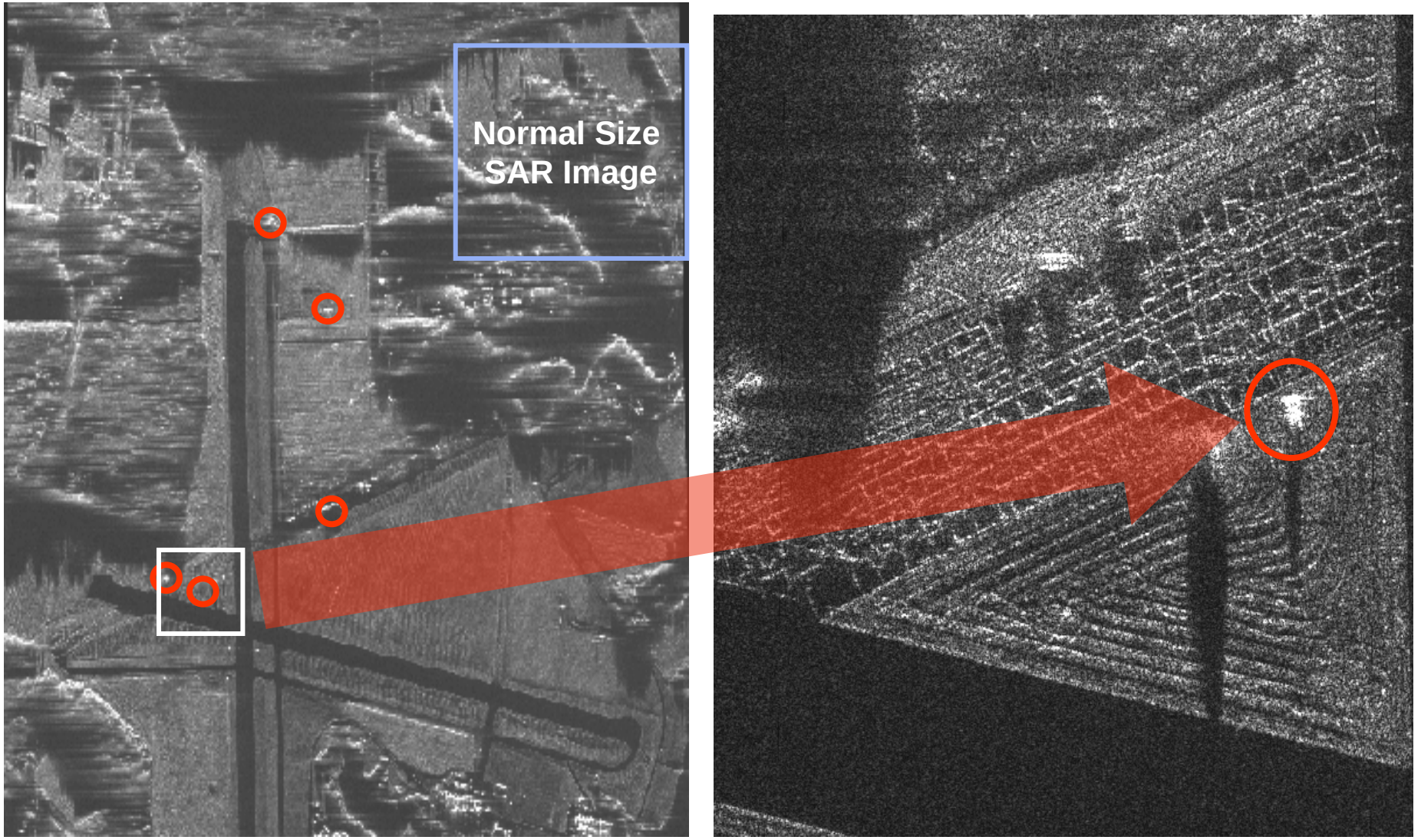
JSF Capability



Long Range SAR Imaging



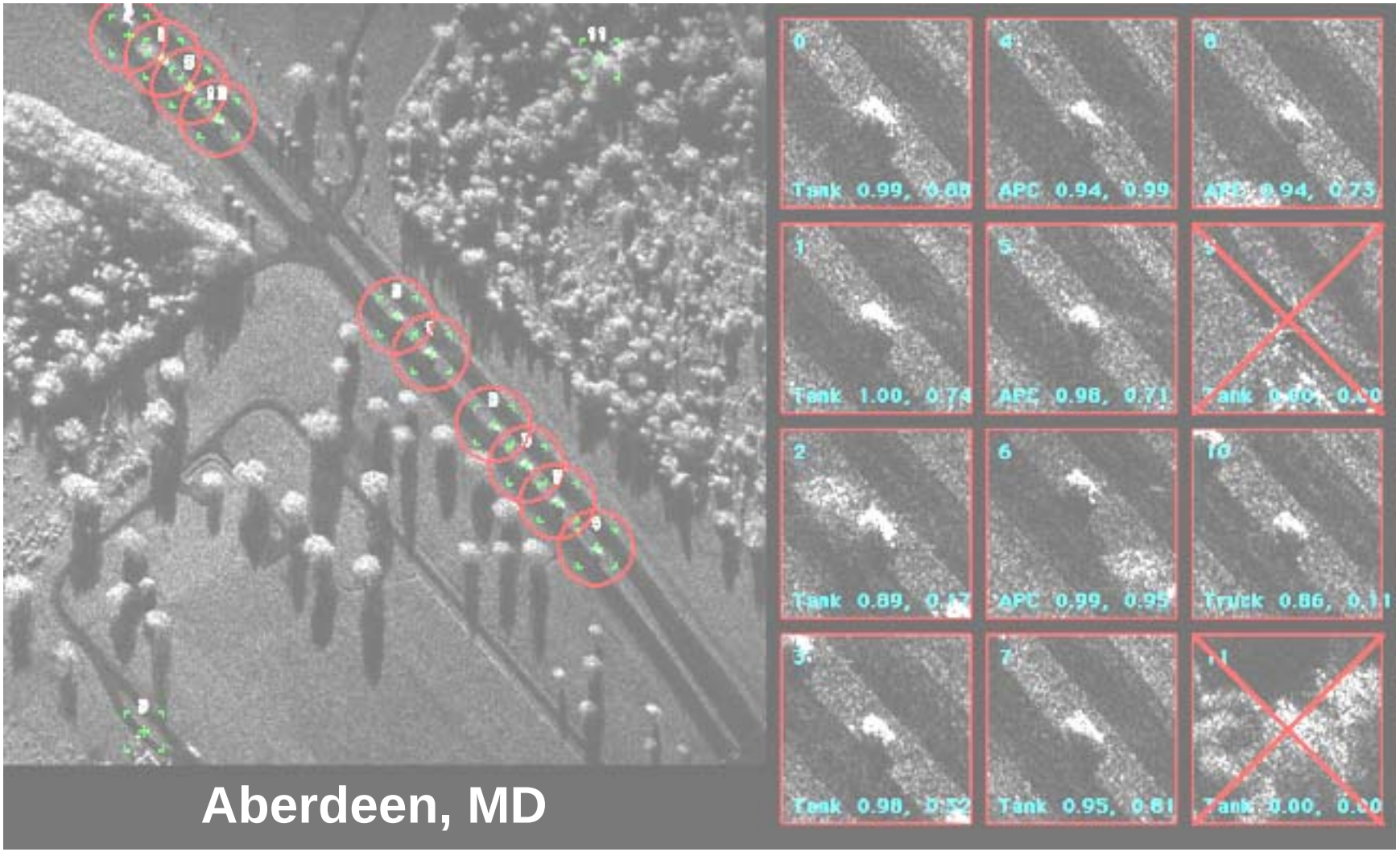
BIG SAR With Auto Target Cueing (ATC)



Automatic Target Cueing

Candidate targets

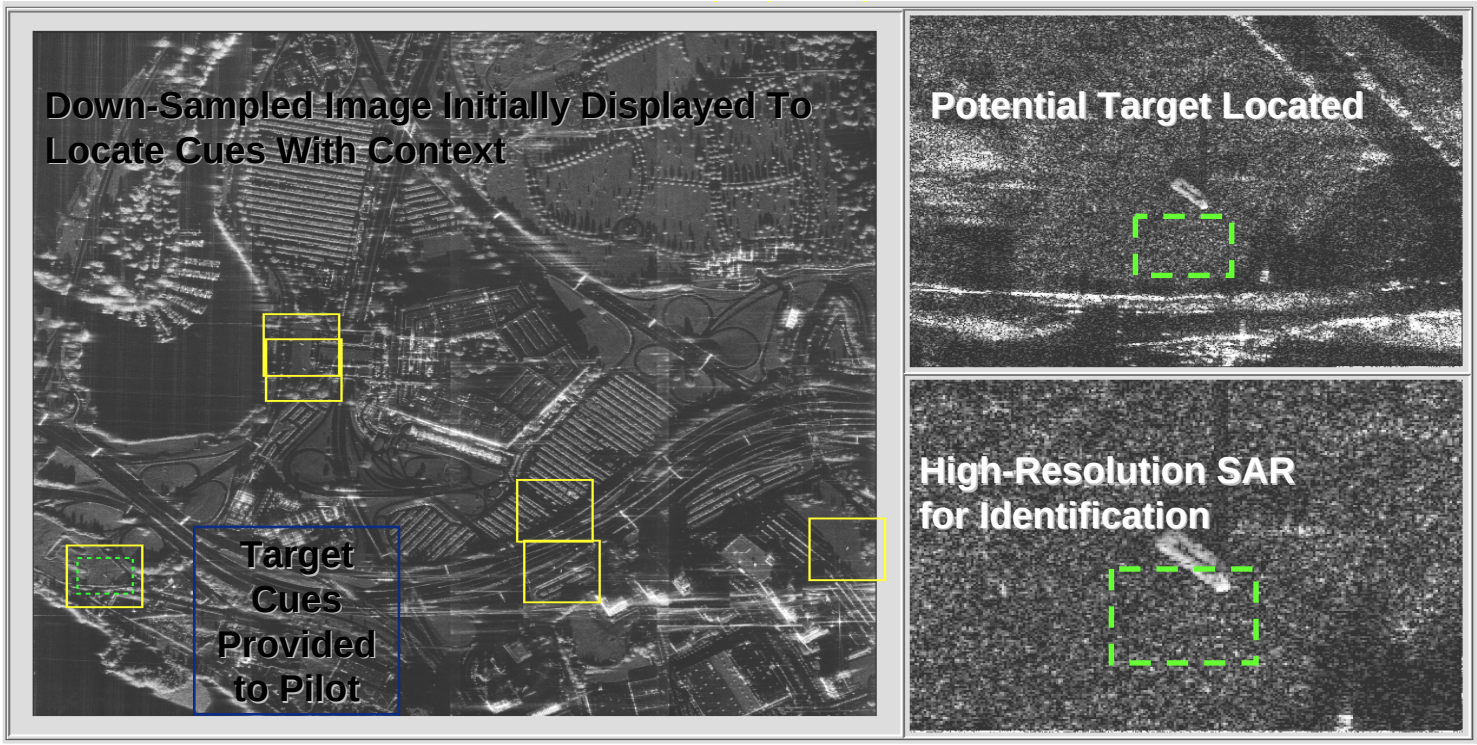
Military targets recognized
Non military targets discarded



Aberdeen, MD

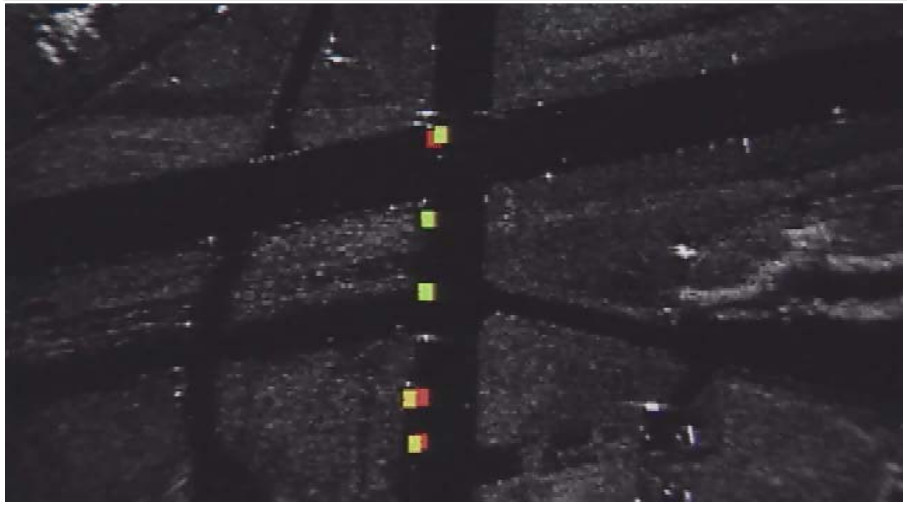
Active Electronically Scanned Array (AESA) Radar

Allows Zoom In/Out Without Additional Radiation Time



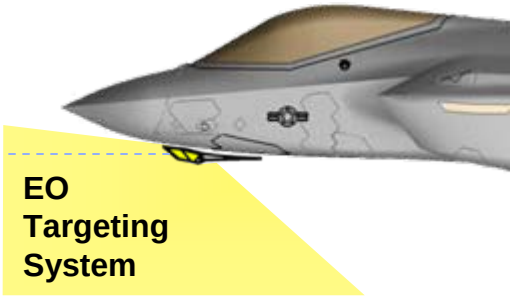
GMTI Mode

- Superimposed on SAR Map
- Capable at Stand Off Ranges



Advanced Internal Electro-Optical Targeting System (EOTS)

- Internally Mounted
- Long Range, High Resolution
- NAVFLIR, Targeting FLIR, IRST Functions
- Digital Continuous Zoom



Distributed Aperture System (DAS)

- 360 degree FOV
- Internally Mounted
- AAA Firing Detection
- Threat Aircraft Detection
- Missile Launch Detection
- Track Wingman
- NAVFLIR Functions
- Integrated With HMD

Criteria

LEVEL 1 CRITERIA	LEVEL 2 CRITERIA
RANGE/AIRSPACE	**RUNWAY**
Distance to training areas	Number
AG Range Capacity	Width
Range Size AG	Length
A-G Range Altitude	Instrument Approaches
Range Capabilities	STOVL Ops
Range Capacity AA	**RAMP SPACE/Flt Line**
Range Size AA	Parking
A-A Range Altitude	Arm/Dearm Pad
WEATHER	**AUX FIELD**
Main Base	Operational Availability
Range	Distance
Aux Field	Altitude
FIELD ELEVATION	**CARRIER OPS**
FLD ELEV	Distance
TEMPO	**AIRSPACE PLUS**
Flight Ops	Airspace Capabilities
CURRENT MISSION	Low Level Routes
	SFO
	Air Refuel
	ENVIRON
	Emissions
	Noise

- Criteria used to determine base suitability on
  - Level I are fixed (can't change)
  - Level II require MILCON to fix/change
  - Level III are business case to be evaluated during Site Surveys
- Air Staff / AETC / ACC / USN / USMC / UK input
- Educated subjective assessments are required

Level I Criteria

CRITERIA/BASE	Green	Yellow	RED
RANGE/AIRSPACE			
Distance to training areas	< 120 nm (20 minutes)	>120 - < 150	> 150 nm
AG Range Capacity	≥4 ranges available for simultaneous use		< 4 ranges available for simultaneous use
Range Size AG	> 1600 sq mi (40 nm x 40 nm) collocated in/beside MOA	250 < sq mi < 1600 not collocated with a MOA	< 250 sq mi (25 nm x 10 nm)
A-G Range Altitude	> 30,000 ft	20,000 < altitude <30,000	< 20,000 ft
Range Capabilities	Full-Scale weapons/ Impact scoring and Threat Emitters	Inert weapons and limited threat emitters, no Scoring	No inert capability and only limited threat emitters
Range Capacity AA	≥ 4 A-A ranges available for simultaneous use		< 4 ranges available for simultaneous use
Range Size AA	≥ 3200 sq mi (80 nm x 40 nm) in MOA	1800 < sq mi < 3200	< 1800 sq mi (30 nm x 60 nm)
A-A Range Altitude	Sfc floor to 50000	Surface floor to > 25K block	< 25k foot block; no areas to sfc
WEATHER	≥ 3000 & 3mi	≥ 3000 & 3 mi	≥ 3000 & 3 mi
Main Base	≥ 300 days	≥ 200 days	< 200 days
Range	≥ 250 days	≥ 200 days	< 200 days
Aux Field	≥ 250 days	≥ 200 days	< 200 days
FIELD ELEVATION			
FLD ELEV	<1000 ft MSL will sufficiently simulate conditions for carrier ops	>1000' - <3000' MSL	>3000 MSL unacceptable
TEMPO			
Flight Ops	No restrictions to training production at home field, aux field or ranges		Unable to meet training production requirements
CURRENT MISSION	Compatible or can be moved		Mission can not be moved or operate with JSF

Summary

- **Very capable sensor suite will require additional airspace to realistically train**
  - **Begin requesting additional airspace**
    - **Preferably 10K and up w/ 100x50 mile chunks**
    - **“J” Series weapons capability**
    - **Begin Environmental Impact Reports (post BRAC)**
  - **Priority is for Test then Training then Ops**
- **Range maintenance will shift from “disposable” targets to very high fidelity targets**
- **Future DE or Laser tgts?**

Questions

Backup Slides

Hugh Harris Scholarship

- My Purpose
  - Provide annual update to the membership
  - Review/Inform membership on application procedures
  - Solicit your continued support by
    - Identifying qualified applicants
    - Providing continued financial support

Purpose of Scholarship

- Memorialize Hugh Harris
- Provide Financial Assistance to Eligible Students
- Encourage Interest in Engineering/Science

Educational Crisis

- In 30 Years US Public Education Dropped from No. 1 in the World to No. 29
  - College graduate engineers continue to decline
- All-Science Degrees (% of total awarded)
  - Korea: 37.8%
  - Mexico: 28.1%
  - US: 17.6%

Scholarship Status

- Established in 1991
- First Scholarship Awarded in 1992
  - One $1000 Award in ’92
  - Increased to seven in 2000
  - Awarded $44K to date
- This year’s winners ($1000 each)
  - Brittany Standley: Univ. of FL, Chemistry
  - Christina Sheperd: Univ. of FL, Engineering
  - Jacob Burns: Univ. of FL, Chemical Engineering
  - Jared Spaniol: Penn State, Plastics Engineering
  - Kevin Thompson: Univ. of FL, Mechanical Engineering

Scholarship Schedule

- 20 January: Members identify applicants
- 1 February: Mail info packets to applicants
- 15 March: Applications to Scholarship Committee
- 1 April: Scholarship Committee ranks applicants
- 10 April: Executive Committee determines number/amount of scholarships
- Mid-August: NDIA issues scholarship grants

Eligibility

- Citizen
- hool senior or graduate
- to/enrolled in accredited 4 year college
- , technical career
- eering: Aerospace, Chemical, Electrical, Civil, Computer
  e, Industrial, Mechanical
- d technical fields: Physics, Chemistry, Mathematics,
  re Engineering

Eligibility (continued)

- Sponsored by Targets/Ranges Division member (individual or corporate)
- Sponsored by Gulf Coast Chapter
- Recipients of full scholarships (military academy, ROTC, etc.) are ineligible
- Enrollments in 2-year community colleges are ineligible
- Complete by-laws are available upon request

Your Responsibilities

- Identify Potential Applicants
- Notify Scholarship Committee

  Cort Proctor

  1542 Glenlake Circle

  Niceville FL 32578

  email: cproctor@gomicrosystems.com

  phone: (850) 240-4909
- Ensure continued donations (corporate/individual)
  - Fund Status - $52,740
  - Funds Administered by NDIA HQ.

2006 Contributors

- NDIA's Gulf Coast Chapter

THANKS

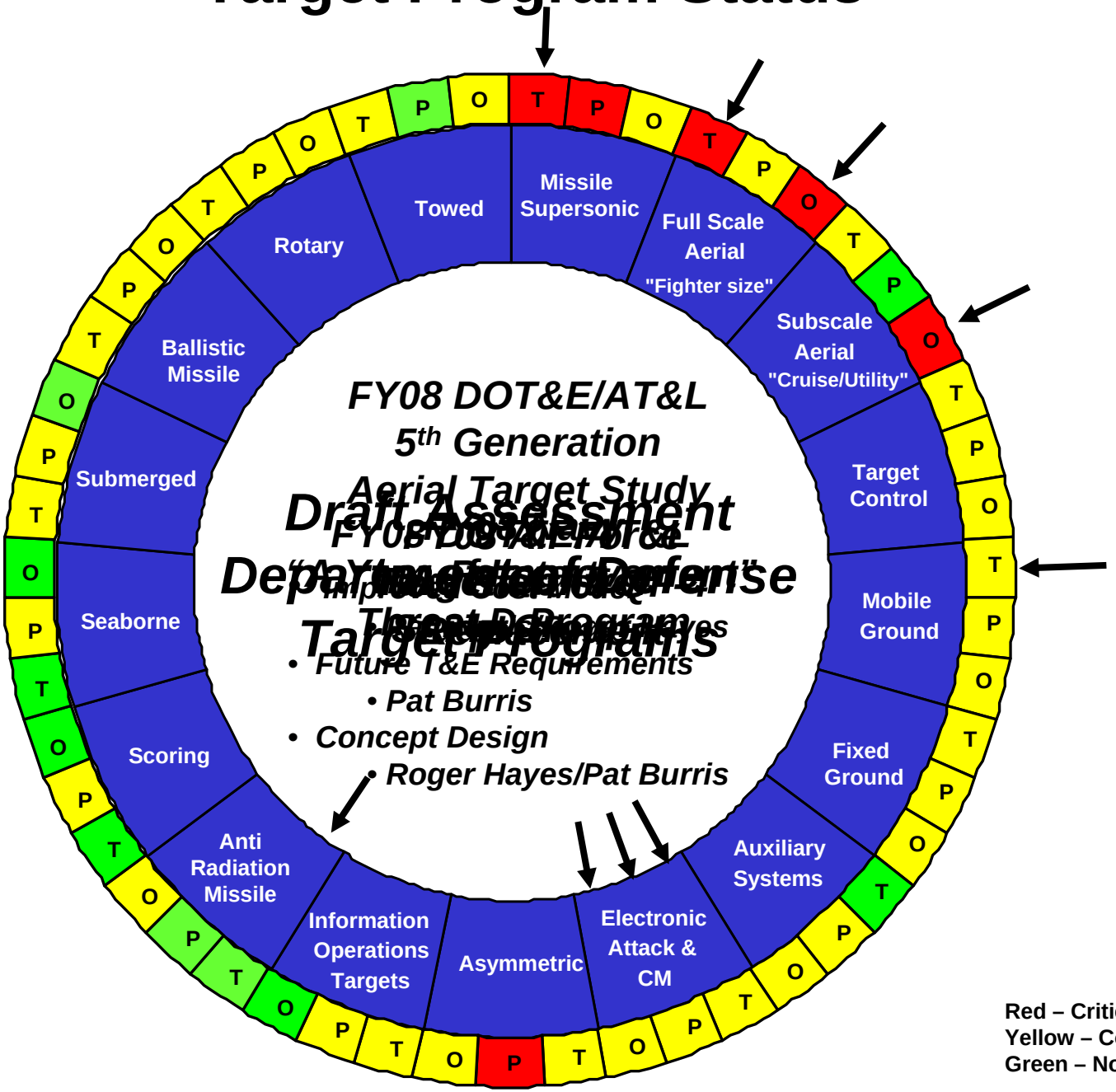
Questions

?

DOT&E's
Targets Overview

Dennis Mischel
(Josh Messner)
DOT&E - Targets

Target Program Status



T - Threat Realism
P - Procurement
O - Other

Red – Critical Issue
Yellow – Concern
Green – No Significant Issue

Target Management Initiatives

FY08 TMI Projects

- DOT&E Directed
  - 5th Generation Full Scale Aerial Target
  - Target Control Study
- Service Executed
  - Navy
    - SLACE
    - CPAM
  - Air Force
    - ACM Target
  - Other On-Going Efforts
    - Realistic Low Cost Target
    - Navy Subscale Flight Demonstration
    - Common Interface Demonstration
    - Multi-spectral Mobile Ground Target System

Less projects but with more OSD focus

Summary

- Significant progress within targets in FY07
  - Start of Threat D program
  - Start of QF-16 program

- TMI Program
  - Study department-wide issues
    - 5th Generation Target
    - Target Control
  - Addressing Service issues
    - Torpedo targets
    - Mobile ground targets
    - Advanced Cruise Missile (ACM) – TARGET?

Background

Fighter Aircraft from Around the World - 2007

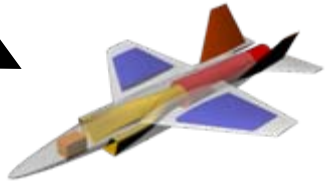
Characteristic	MiG-19	MiG-21	MiG-23	F-15	J-8	F-16	Mirage 2K	MiG-31	F-117	Su-27	MiG-29	JH-7	JAS-39	Rafale	F/A-18E	EF-2000	J-10	Su-34	FC-1	MiG MFI	S-37	F-22	F-35	XXJ
Length, ft	41.0	51.7	56.8	63.8	70.2	49.3	48.1	74.4	69.8	72.0	57.0	68.9	46.3	50.1	60.1	52.3	50.9	76.4	49.1	65.6	74.2	62.1	50.5	N/A
Wing Span, ft	30.2	23.4	25.5	42.8	30.7	31.0	29.9	44.2	43.3	48.3	37.3	42.0	27.6	35.4	44.7	35.9	31.8	45.9	31.0	49.2	54.8	44.5	35.0	N/A
Wing Area, ft²	270.0	247.5	367.7	608.0	454.0	300.0	441.0	663.0	780.0	667.0	409.0	563.0	275.0	492.0	500.0	536.0	419.8	667.4	262.7	N/A	602.0	840.0	459.6	N/A
Aspect Ratio	3.4	2.2	1.77	3.0	2.1	3.2	2.0	2.9	2.4	3.5	3.4	3.1	2.8	2.5	4.0	2.4	2.4	3.2	3.7	N/A	5.0	2.4	2.7	N/A
Empty Weight, lbs	11,983.0	11,800.0	21,153.0	28,600.0	22,864.0	18,600.0	16,535.0	48,104.0	29,500.0	36,100.0	24,250.0	35,057.0	12,346.0	19,974.0	29,574.0	21,500.0	18,260.0	46,930.0	14,134.0	N/A	N/A	31,670.0	26,000.0	N/A
Combat Weight, lbs	14,663.0	19,200.0	28,668.9	44,500.0	28,995.1	24,601.0	22,240.9	71,329.9	37,328.8	45,298.4	31,941.0	44,359.0	17,266.0	27,112.9	39,194.0	28,887.7	26,022.0	62,000.0	N/A	N/A	N/A	45,000.0	35,000.0	N/A
Wing loading, lbs/ft²	54.3	77.8	78.0	62.1	63.9	82.0	50.4	107.6	47.9	67.9	78.1	78.8	62.8	55.1	78.4	53.7	62.0	92.9	N/A	N/A	N/A	53.6	76.2	N/A
Number of Engines	2	1	1	2	2	1	1	2	2	2	2	2	1	2	2	2	1	2	1	2	2	2	1	N/A
Mil Thrust, lbs (S/L)	N/A	N/A	18,850.0	29,180.0	21,194.0	17,800.0	14,400.0	41,888.0	21,200.0	N/A	24,250.0	24,500.0	12,141.0	22,486.0	28,000.0	27,000.0	17,857.0	N/A	N/A	N/A	N/A	56,000.0	28,000.0	N/A
AB Thrust, lbs (S/L)	14,356.0	15,700.0	28,700.0	47,540.0	30,864.0	29,100.0	21,400.0	77,160.0	21,200.0	55,200.0	38,800.0	41,030.0	18,105.0	33,686.0	44,000.0	40,500.0	27,557.0	65,120.0	18,277.0	78,040.0	78,040.0	70,000.0	43,000.0	N/A
Thrust/Weight Ratio	0.96	0.82	1.00	1.26	1.06	1.18	0.96	1.08	0.57	1.22	1.21	0.92	1.05	1.24	1.12	1.40	1.06	1.05	N/A	N/A	N/A	1.56	1.23	N/A
Max. Speed, Mach	1.37	2.00	2.35	2.50	2.20	2+	2.20	2.83	0.92	2.35	2.30	1.70	1.80	1.8+	1.8+	2+	2.20	1.80	1.80	2.35	1.60	2.42	>1.8	N/A
Service Ceiling, kft	57.4	62.3	N/A	65.0	59.1	50.0	59.1	67.6	69.0	60.7	55.8	51.2	50.0	55.0	50.0	60.0	65.6	65.0	50.0	N/A	59.1	65.0	N/A	N/A

DoD's Fighter Size Target Program

Current

2015 - 2020

2018 and Beyond



5th Gen

5th Generation Full Scale Aerial Target Study

PDM II

- Directed Study of required 5th Generation Requirements
  - Stealth
  - Maneuverability
  - Speed
  - Payloads

Report stated an additional study was needed

DOT&E/AT&L Study

- Future test requirements
- Commercial cost models
- Affordable prototype?

Report due in March to potentially effect POM

Involvement

- Air Force (AFA, AFRL, ACC, AAC)
- Navy (NAVAIR)
- Cost Team (Air Force and IDA)
- Industry (Cirrus, Swift, Eclipse, Adam)

Target Control Study

Defense Science Board Report

"The Task Force can envision the gradual introduction of common control elements into each range to provide an increasing degree of interoperability, test flexibility, and lower operational costs."

Prior common control systems have failed

Navy Lead DoD Study

LEW Warfare Memo

- Identify joint common elements
- Open Architecture
- Open Source Software
- Protocols and Standards

Feasibility report due in March

Involvement

- Air Force, Navy and Army
- OSD (TRMC,DT, DDRE)

Target Management Initiative
New Start Project

SUBMARINE LAUNCHED COUNTERMEASURE EMULATOR (SLACE) DESIGN STUDY

Project Description:

- Identify SLACE requirements, design approaches and options, and submarine launch certification requirements
- Develop SLACE performance specifications
- Conduct feasibility, cost, and design tradeoff analyses
- Recommend an optimum SLACE design approach
- Execute a preliminary system level SLACE design
- Deliver preliminary system level design package

Project Requirement:

SLACE vehicles are required to support FY10 OPTEVFOR operational test of CBASS torpedo and ARCI sensor systems in the presence of mobile countermeasures

Other Sources of Funding: None

Proposal Endorsement:

OPTEVFOR will endorse proposal

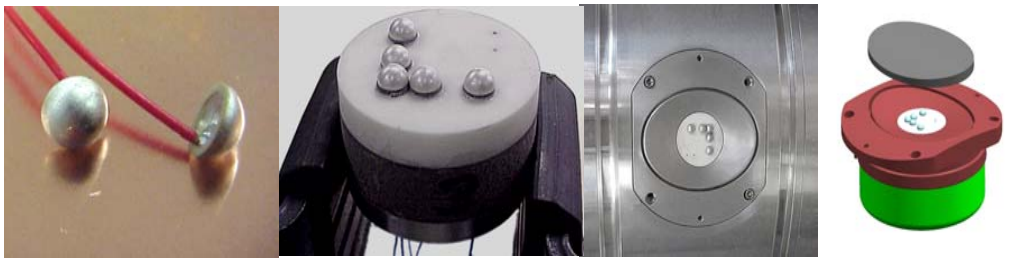
Project Director:
Clarence Ching / NUWC Div Keyport / Comm: (360) 396-1099 / Email: clarence.ching@navy.mil / Navy

Target Management Initiative
New Start Project

CPA PASSIVE MEASUREMENT (CPAM) MINI-ARRAY

Project Description:

- Identify Closest Point of Approach (CPA) passive measurement requirements
- Develop CPAM mini-array performance specifications
- Conduct feasibility, cost, and design tradeoff analyses
- Identify most likely CPAM mini-array design approach(es)
- Design, fabricate, assemble mini-array candidate(s)
- Bench test/In-water test mini-array candidate performance
- Identify suitable mini-array candidate(s) that meet CPAM performance specs



Project Requirement:

FY11 Containerized Countermeasure Anti-Torpedo passive attack development spiral mandates Torpedo Proximity Scoring System (TPSS) passive CPA measurement upgrade

Other Sources of Funding:

PMS 415 - $150K
ONR - $150K
Total - $300K

Proposal Endorsement:

PMS 415 and ONR endorse proposal

Project Director:
Clarence Ching / NUWC Div Keyport / Comm: (360) 396-1099 / Email: clarence.ching@navy.mil / Navy

Multi-spectral Mobile Ground Target System (MMGTS)

System Description and Capabilities Summary

For more information, contact:
Mr. Joshua Messner
DOT&E Target Resources
Joshua.messner@osd.mil
Phone: (703) 681 - 5502

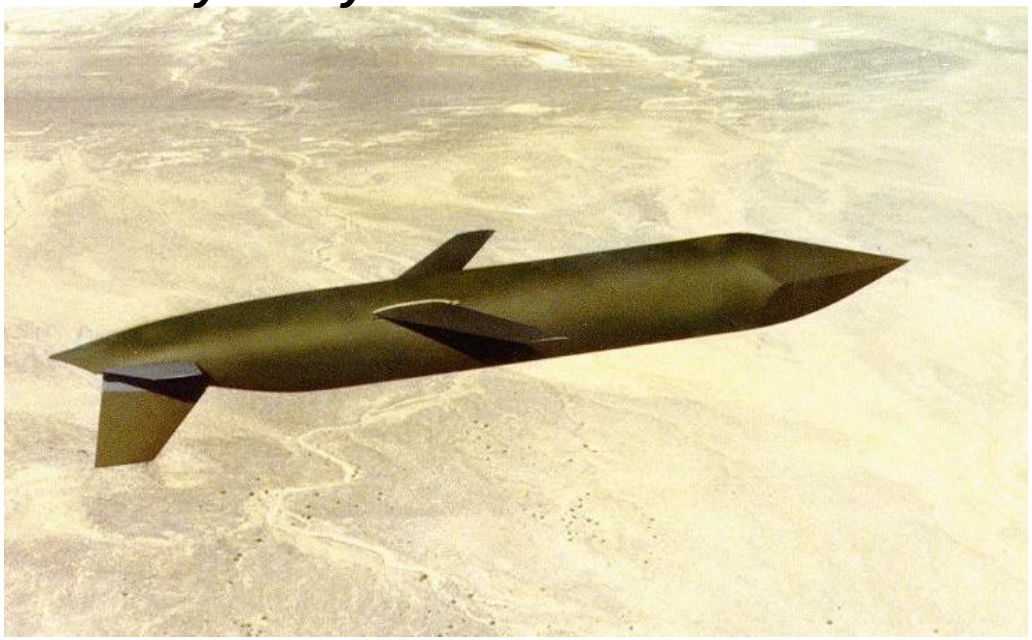
Target Management Initiative

New Start Project ?

New Mission for Advanced Cruise Missile
Drone Feasibility Study

Project Description

- **Feasibility Study to determine if Advanced Cruise Missiles may be retrofitted to become air drone to meet future target requirement**



Robert Dang; Tinker AFB, 706 MSUS, Robert.Dang@tinker.af.mil,

Defense Science Board

2005 Report on Aerial Targets

Recommendations on Full-Scale Targets

1. **Immediately develop a drone replacement for the QF-4 using an existing aircraft platform. Seek to eliminate requirements for man-rating.** ***(U.S. Air Force)***

   The Task Force views this as a straightforward process that will fill our mid-term needs. The Task Force sees little need for lengthy investigations, so no gap in our mid-term capability should occur.

2. **Immediately begin a concept demonstration of a new, unmanned, full-scale drone that can capture important features of advanced fighter-size aircraft.** ***(U.S. Air Force)***

   A modest investment here will serve to sort out the possible approaches and put us on a path to produce the next-generation full-scale drone to deal with testing against advanced aircraft.

NDIA 2007

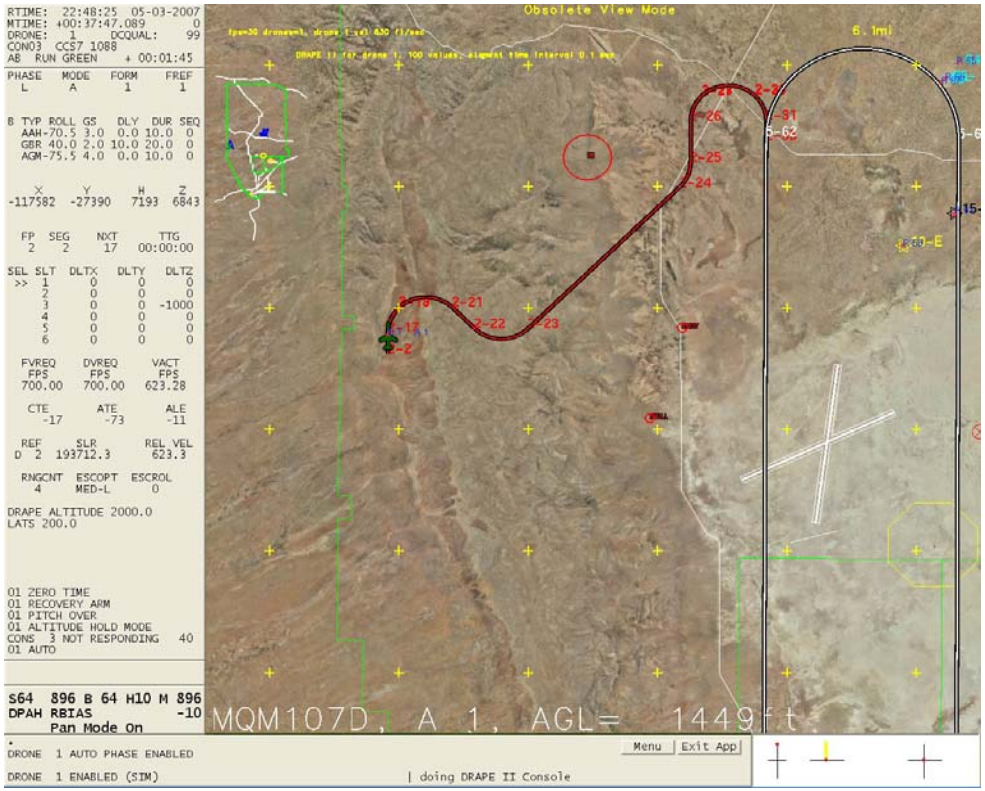
“Real-Time Trajectory Planning (RTTP) for Targets”

Luis E. Alvarado, PROTEUS & Manuel Soto, UNITECH

“RTTP in Action-MQM107E Simulation”

Project Description

- Develop a RTTP to safely generate target presentation profiles in real-time.
- Demonstrate application of AI and a high resolution environmental DB to threat presentation management
- Reduce man-hours required to develop flight profiles, reduce RCO workload and increase mission flexibility.
- Brings threat management system closer to allowing project personnel to safely control target presentations.



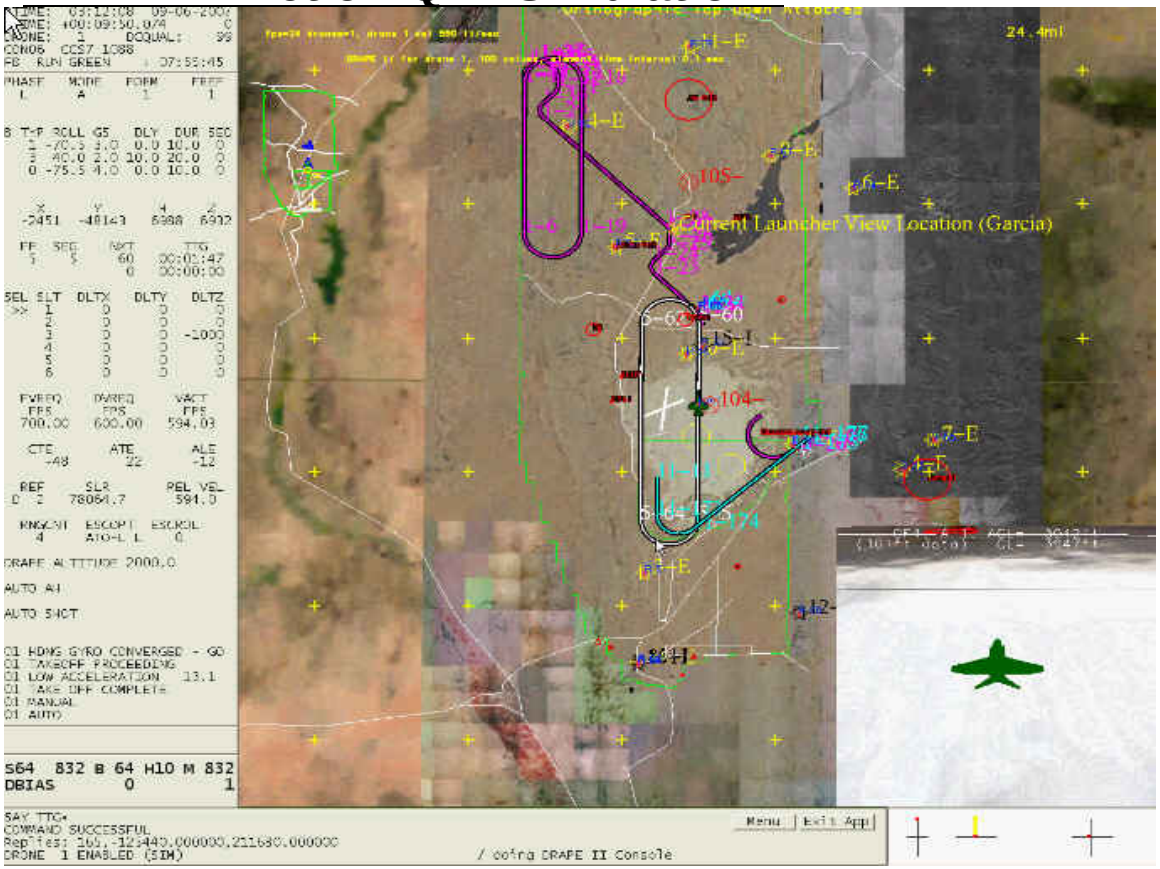
Manuel Soto /505-678-5268 / manny.soto@us.army.mil
Luis E. Alvarado /505-678-4885/luis.e.alvarado@us.army.mil

3D Video

NDIA 2007

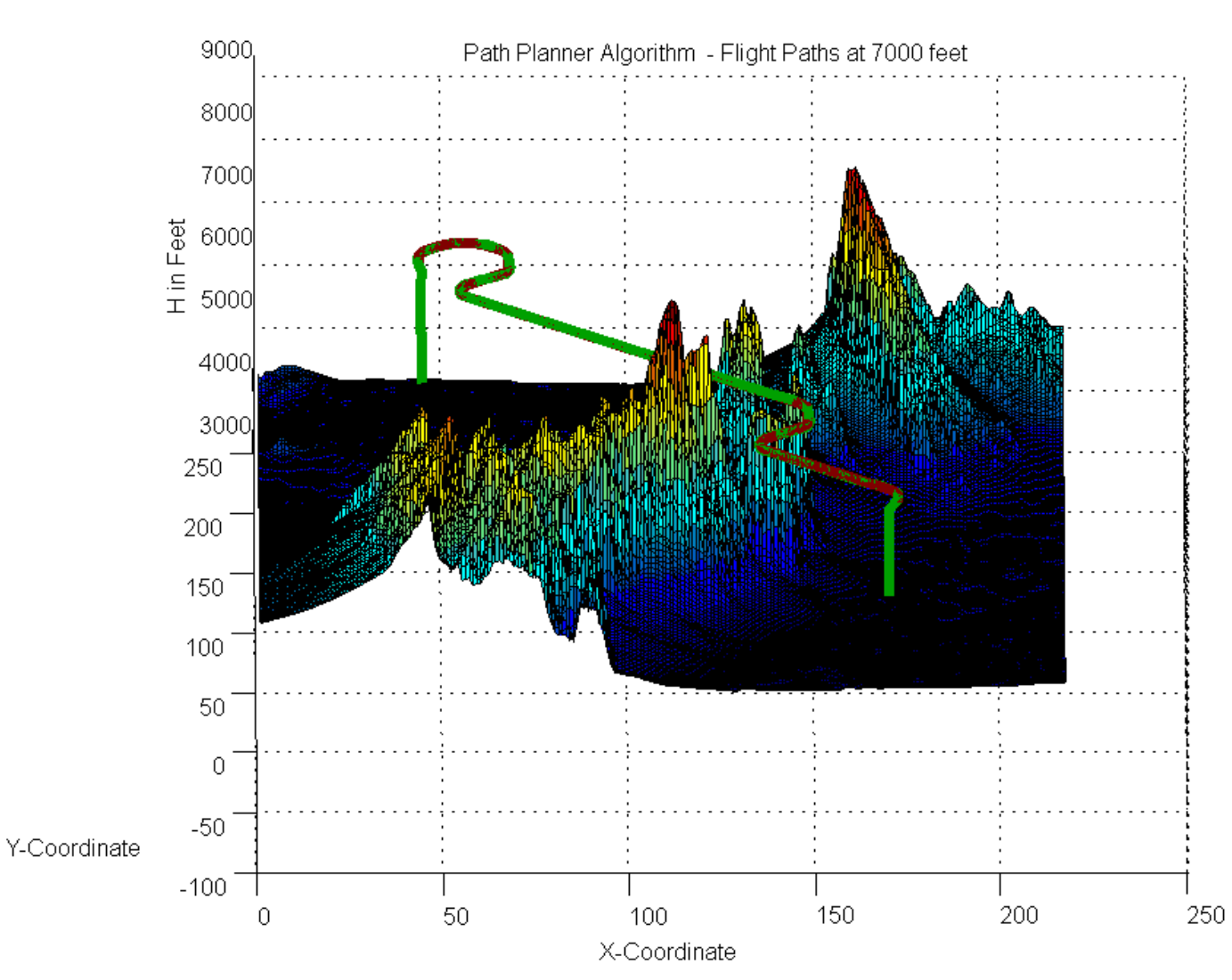
Real-Time Trajectory Planning for Targets

“RTTP in Action-QF4 Simulation”



3D Video

RTTP Trajectory 3D Plot



Briefing Outline

“Real Time Trajectory Planning”

- DFCS
- Problem Statement
- Project Overview
- RTTP Hardware and Software
- Simulation Results
- Future Work
- Questions

DFCS

- The RTTP was integrated into the Drone Formation Control System. The DFCS is a target control system at WSMR. Its mission is to control single and/or multiple unmanned full-scale and sub-scale targets for the Army to test and evaluate new threat systems under different scenarios. DFCS can control the QF-4 full-scale target, the BQM-34A and MQM-107 aerial targets and ground targets such the M-60 and T-72 tanks and the M-812 five ton truck.
  - Simulation – Very accurate 6-DOF models for all aerial targets
  - Navigation
    - Use weighted LSQ filter to process Distance Measuring Equipment (DME) data
    - Use Kalman filter to derive velocity and target accelerations from GPS position data; use target acceleration and telemetry to propagate target position during GPS data link outages.
  - Guidance – Flight Pattern guidance and Waypoint guidance
  - Control – Ground system handles the low frequency loops, the autopilot handles the high frequency control. Both use PID and Non-Linear control techniques.

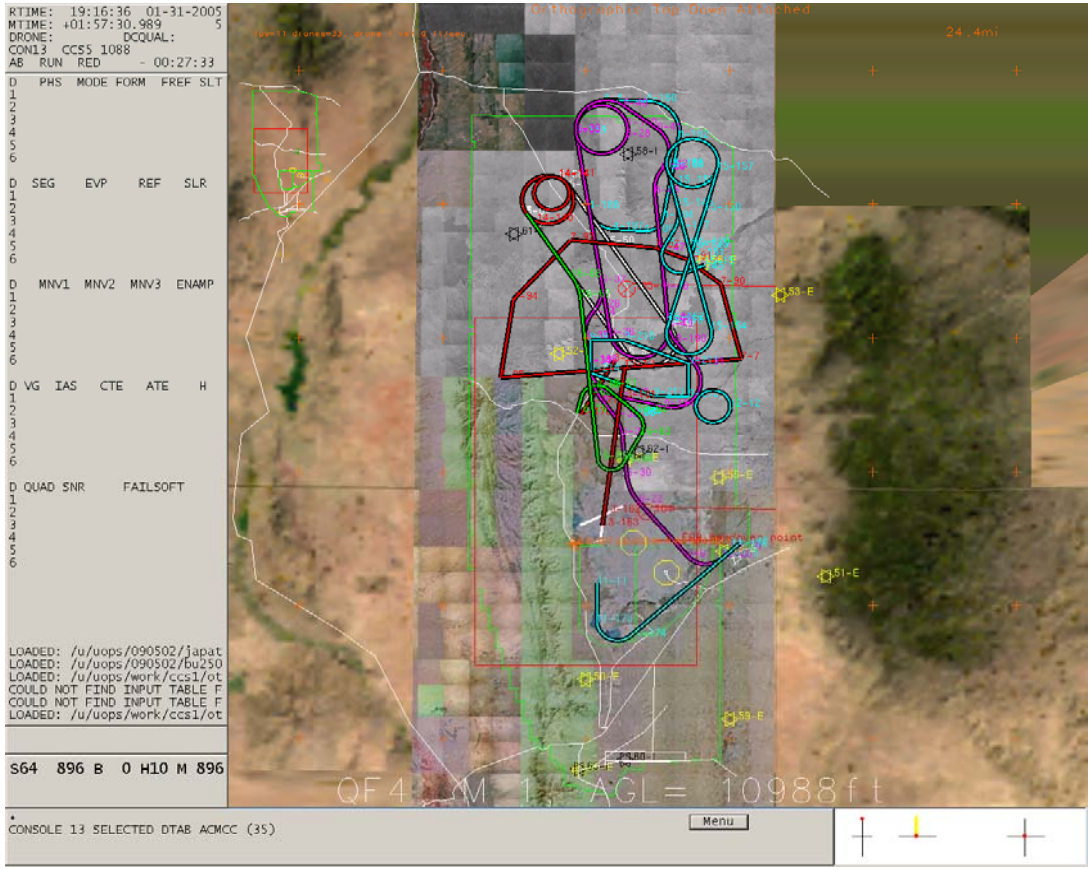
Problem Statement

- The Guidance Algorithms presently used by target control systems utilize flight patterns (FP) composed of circular arc segments and straight segments. These FP must be created prior to the mission. Present target control systems have the capability to translate and rotate these patterns in real time, however changing the geometry and symmetry of these patterns is a very cumbersome process that cannot be safely done in real time.

- These target control systems do not have the capability to automatically generate flight trajectories that are safe to fly at low elevations over mountainous terrain and avoid flying over pre-defined no-fly zone areas.

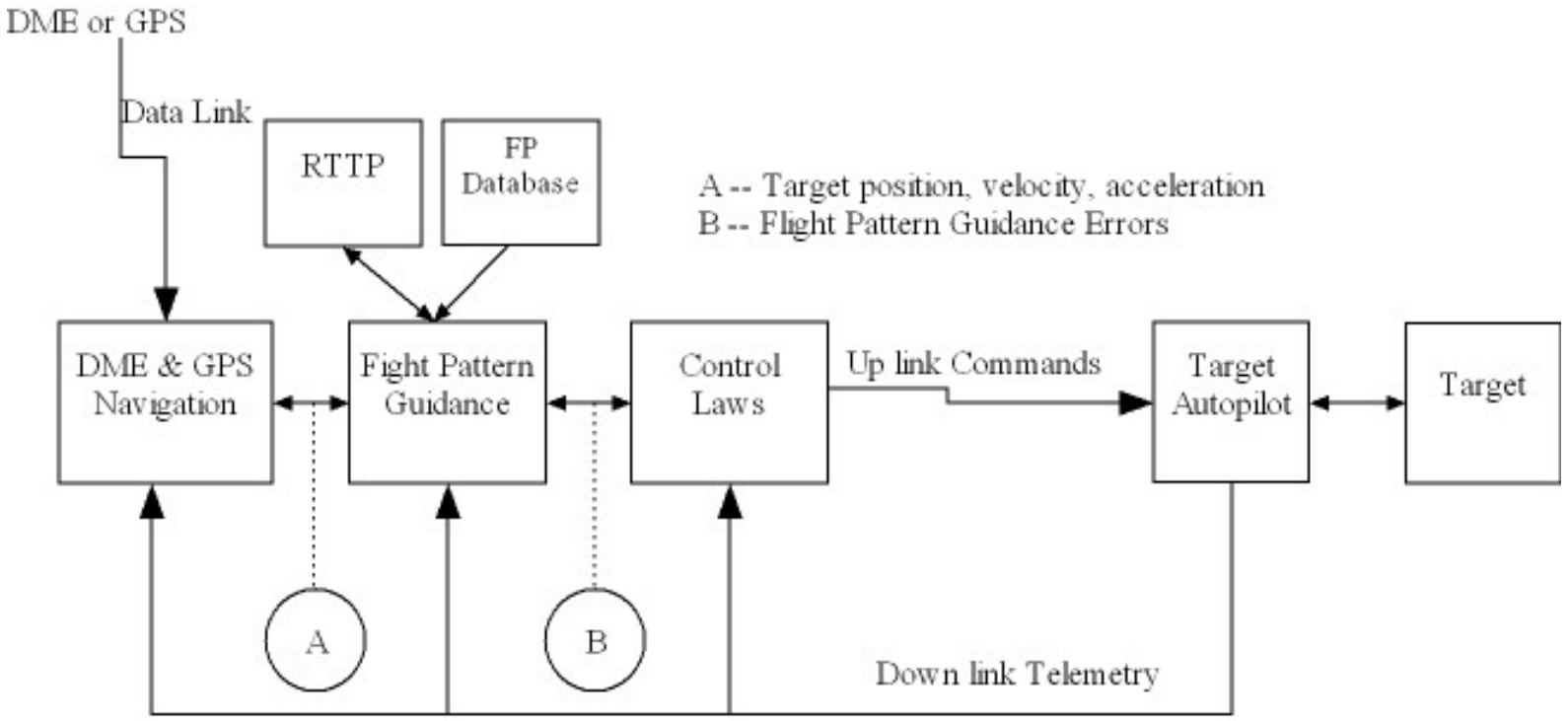
- The mission operator will have the capability to generate flight pattern profiles in real time by simply providing the start and termination coordinates of the desired pattern.

Project Overview
DFCS Typical Man-Made Flight Profiles



Project Overview (cont)
DFCS Controls and Displays

Project Overview
DFCS/RTTP Architecture



Project Overview (cont)

- The DFCS communicates with the RTTP via UDP. The DFCS controller can control RTTP functions via keyboard commands entered at the controller's console.
- Automatically selects the best path given a starting point and the goal. The best path decision is based on a cost function that includes, terrain information, aircraft velocity, and no fly zone areas such as range boundaries and optical sites.
- Uses splines constructed of straight segments and variable size radius arc segments to develop flyable paths. The turn radius (R) is proportional to the target ground speed (Vg) for a given target bank angle (ø) and vertical acceleration (Az)
- Uses the A* algorithm to determine best path based on DTED level 2 data and pre-determined no-fly zone areas.

Project Overview (cont)
A* Algorithm

- Search Graph – a 2D plane at elevation h = UAV MSL altitude, partitioned at intervals equal to the UAV turn radius
- Path Returned – NULL or a series of nodes linking the start location and the destination location
- Evaluation function – orders the nodes for expansion (the sum of cost and heuristic functions)
- Cost function – Obstacle Avoidance, Minimum AGL, Start and Destination Headings, Penalizes locations
- Heuristic function – 2D Euclidean distance on h = UAV MSL altitude plane

Project Overview (cont)
Flight Pattern Generation

- Iterative A* Search – Discards A* routes that are not maneuverable by the UAV
- Waypoints – Output processed from maneuverable A* route
- Flight Pattern – Output processed from waypoints

Project Overview
RTTP Commands

PATH ASTAR	Request FP from RTTP with specific attributes: target #, initial route position, initial true heading, FP altitude, final route position and heading, minimum FP AGL allowed, maximum expected target ground speed.
ADD ASTAR	Request FP from RTTP with the following attributes: target #, final route position and heading, minimum FP AGL allowed, maximum expected target ground speed. The start position and flight pattern altitude and initial FP heading are equal to the position, heading and altitude of the target at the time the command is entered.
SEG ASTAR	Request FP from RTTP with the following attributes: target #, final segment number, minimum FP AGL allowed, maximum expected target ground speed. The start position and flight pattern altitude and initial FP heading are equal to the position, heading and altitude of the target at the time the command is entered. The final FP heading is the heading of the start segment on the connecting FP.
ENA ASTAR	Enable UDP communication between RTTP and DFCS
INH ASTAR	Inhibits UDP communication between RTTP and DFCS

Project Overview (cont)

- The generated flight patterns are displayed on the DFCS consoles.
- The operator has the capability to delete unwanted flight patterns and re-generate any other pattern in real time.
- The RTTP can also be used to generate flight patterns in off-line mode; prior to the actual mission. The generated patterns can also be saved into files and retrieved at any point in time per user request.
- The RTTP co-exits with legacy DFCS guidance and control algorithms including with the DFCS nap-of-the earth algorithm named DRAPE. Once the FP is generated by RTTP, the automatic control is done using legacy DFCS control algorithms to control the speed, cross track and the altitude of the target.

Project Overview (cont)

- The operator has the capability to change some of the cost function parameters in real time based on desired mission objectives (i.e. desired target altitude above ground level, maximum target speed, and minimum AGL altitude allowed.

- Presently, the RTTP process resides in a separate Windows based computer. This computer is designed to act as a server for any target control system that uses legacy DFCS flight pattern guidance and control algorithms; TCS, GRDCS and TTCSU.

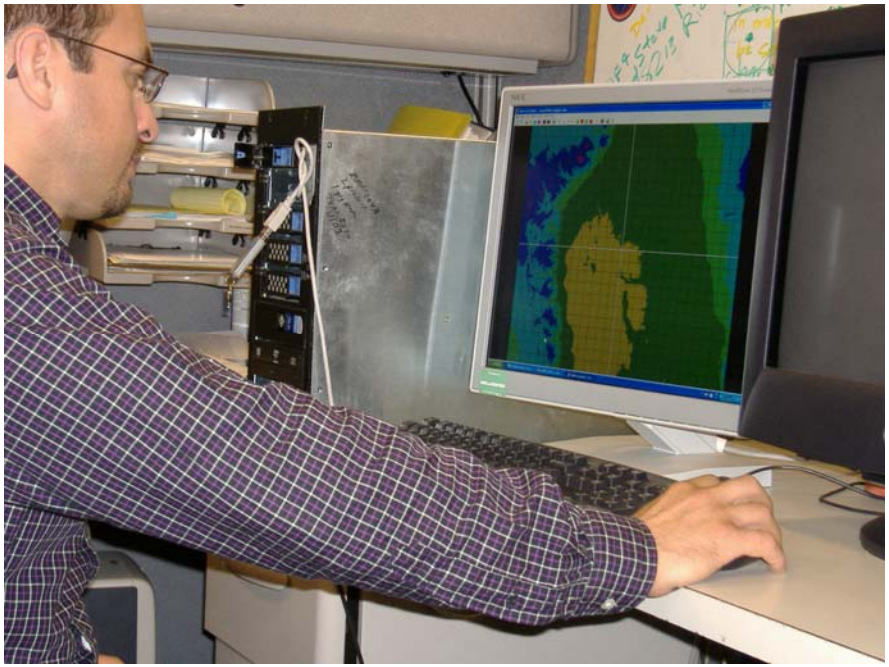
- The RTTP will protect the operator against selecting start and destination points that do not make any sense.

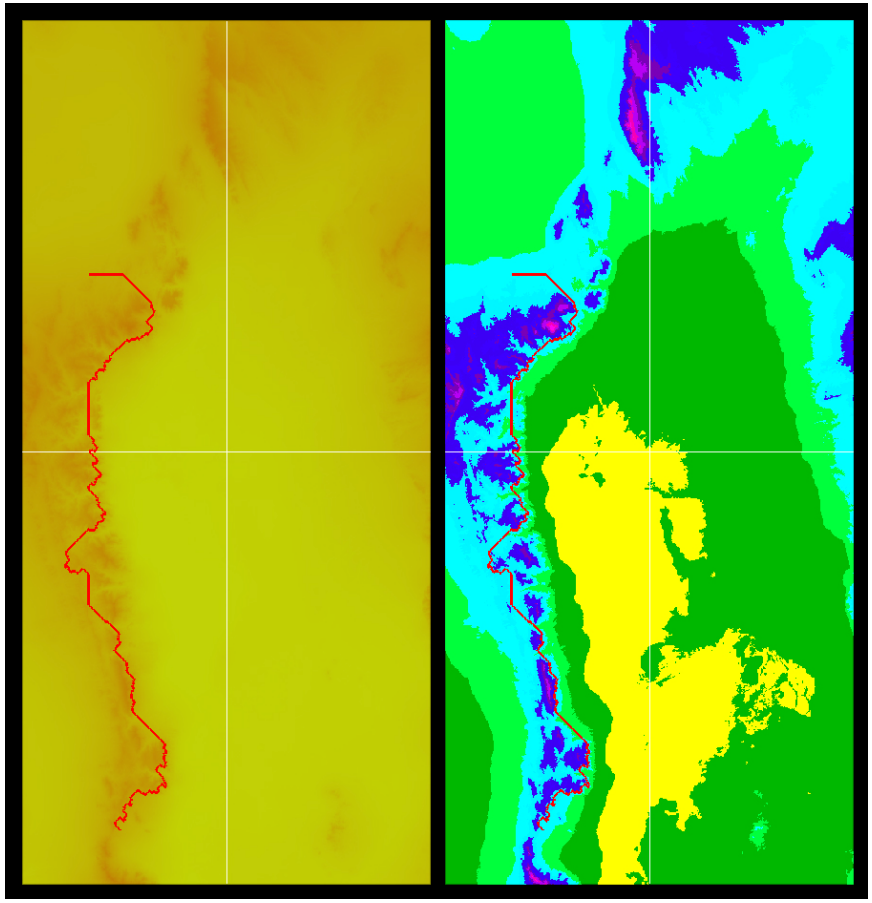
RTTP Hardware and Software

- Dual core 3.5 GHZ Windows based PC, 2 gigabytes of memory
- Windows XP
- C++ OO Design
- DTED Level 2 data
- Applicable to DFCS, TCS, GRDCS or TTCSU

RTTP Test Bed

A* Path generation over WSMR using computer mouse





RTTP Simulation Results

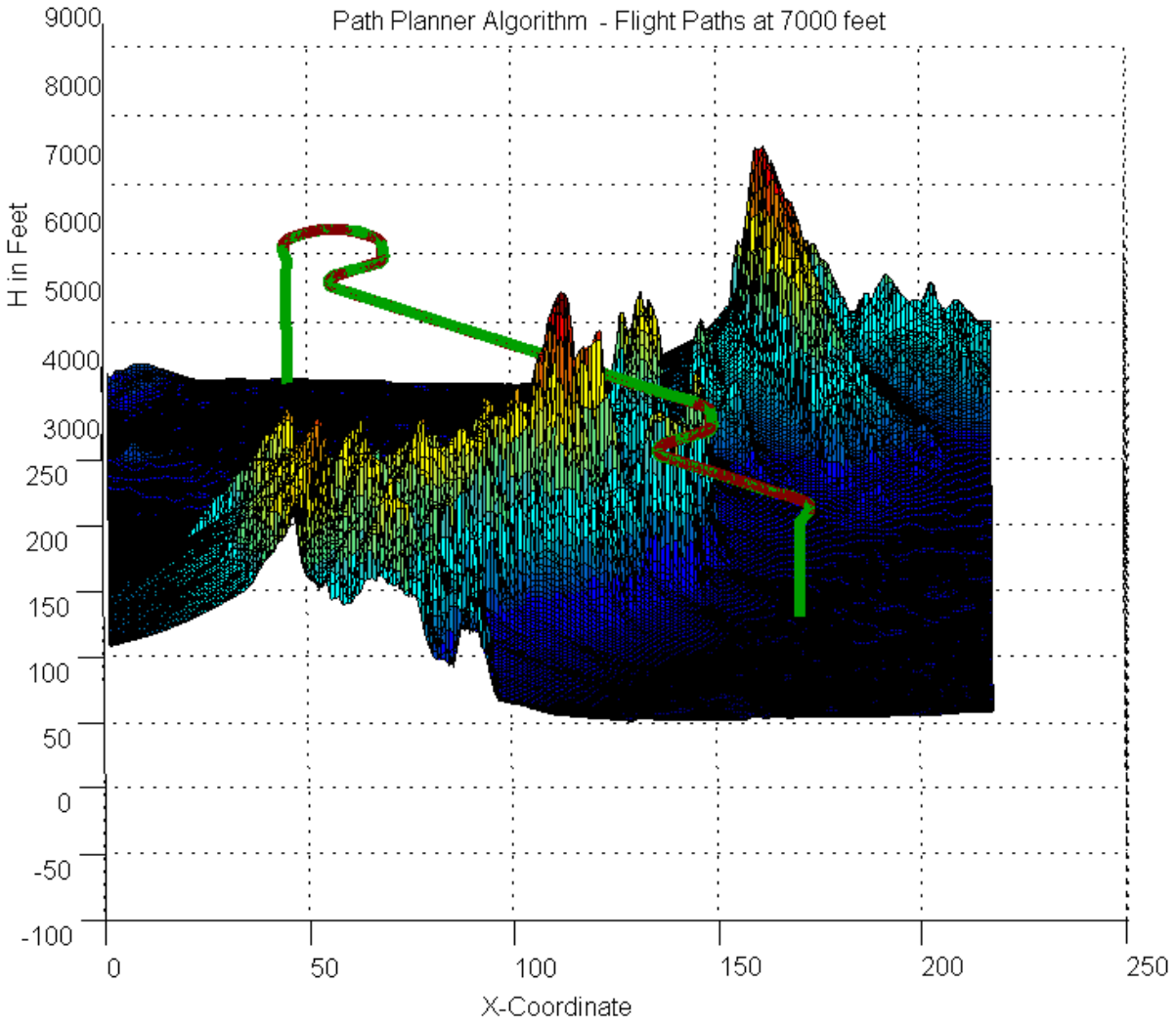
- Plot 1 shows a 3D plot of the path generated by the RTTP algorithm. The SEG ASTAR command was used to generate a path between two existing flight patterns.
- Plot 2, subplot 1, shows terrain underneath pattern below FP altitude
- Plot 2, subplot 2, shows target AGL altitude stayed above the minimum AGL allowed.
- Plot 3 shows the terrain elevations close to the target.
- Plot 4, subplot 1, shows the cross track error during flight. The maximum error was > 500 feet.
- Plot 4, subplot 2, shows the roll command is limited to 60 degrees.
- Plot 4, subplot 3, shows the normal accelerations stayed below 2.5 Gs
- Plot 5, subplot 1, shows the target stay with the rabbit; small along track errors.
- Plot 5, subplot 2, shows slight speed variations from the commanded speed of 600 fps.
- Plot 5, subplot 3, shows good altitude control.

Simulation Results (cont)
Conclusion

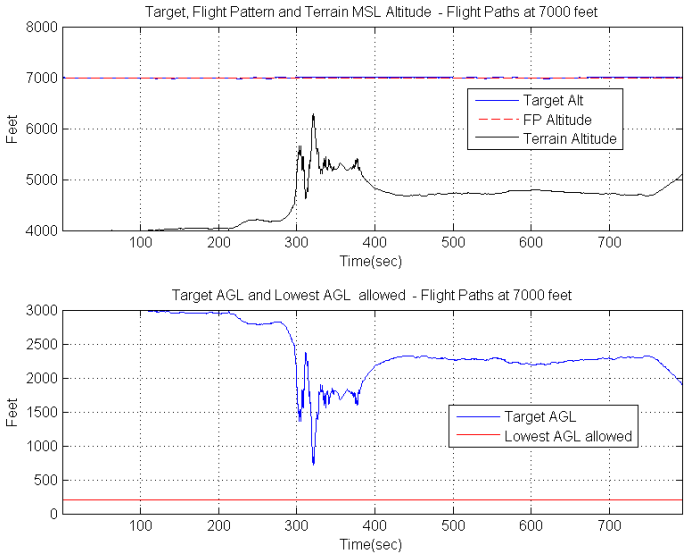
- Cross track can be considerably improved by making the commanded (rabbit) speed at least 10% lower than the expected flight pattern speed used to generate the pattern. This would insure that the flight pattern turn radii are large enough for the target to stay on the pattern during turns.

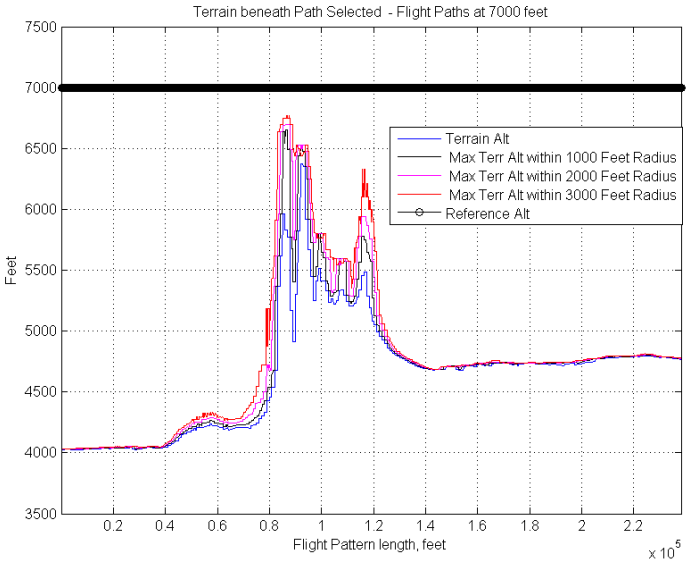
- The patterns generated by the RTTP are flyable and safe

Simulation Results
Plot 1

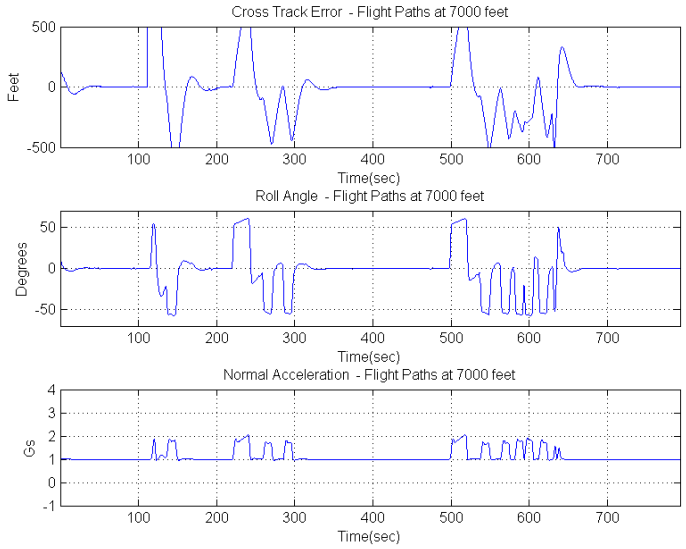


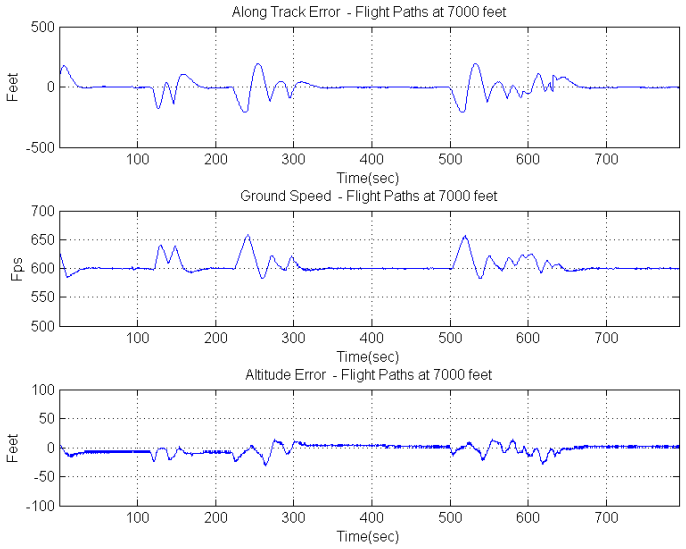
Simulation Results (cont)
Pattern at 7000 feet MSL - Plots 2 and 3



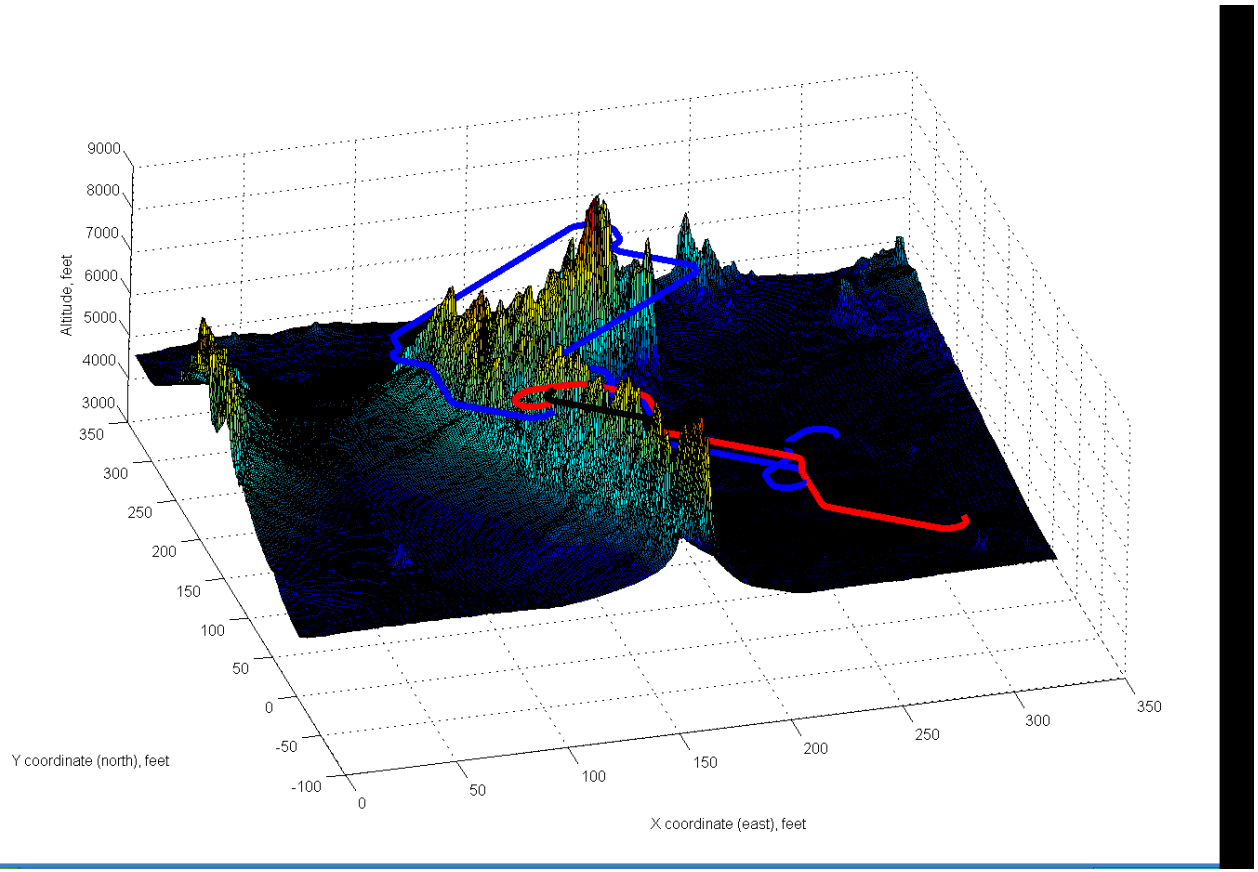


Simulation Results (cont)
Pattern at 7000 feet MSL - Plots 4 and 5





More Simulation Results



RTTP Future Work

- Improve RTTP heuristic function to avoid getting so close to the mountains when not required.
- Incorporate target visibility and obscuration requirements to path generation.
- Control path length and consequently control time of arrival of target to destination point to achieve target synchronization.
- Upgrade user interface – (i.e. touch screens)
- Make RTTP operational

Response to Questions

- QUESTIONS ?
- CONTACTS
  - Luis E. Alvarado, 505-678-4885

National Defense Industrial Association

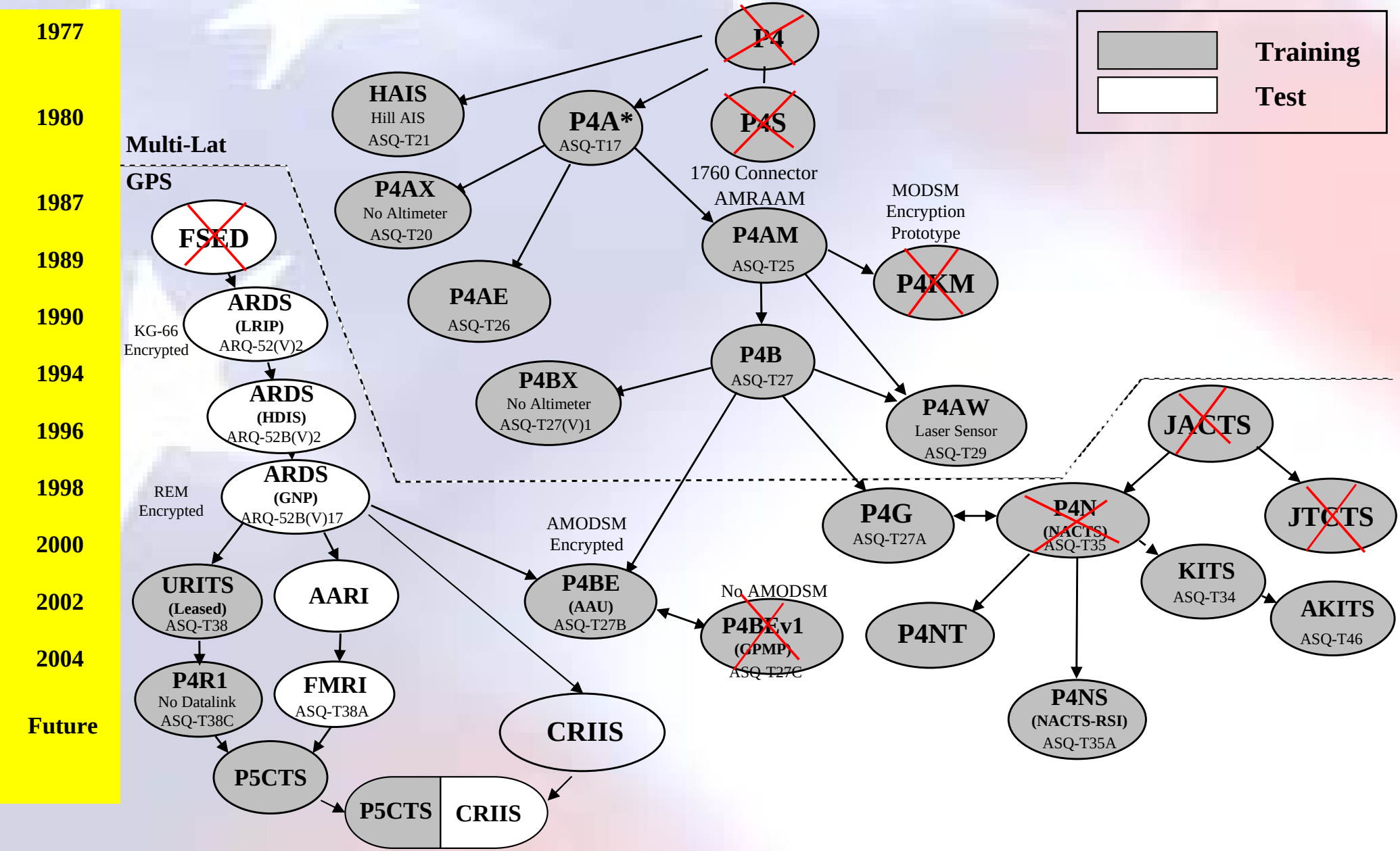
War-Winning Capabilities…On Time, On Cost

Common Range Integrated Instrumentation System (CRIIS)

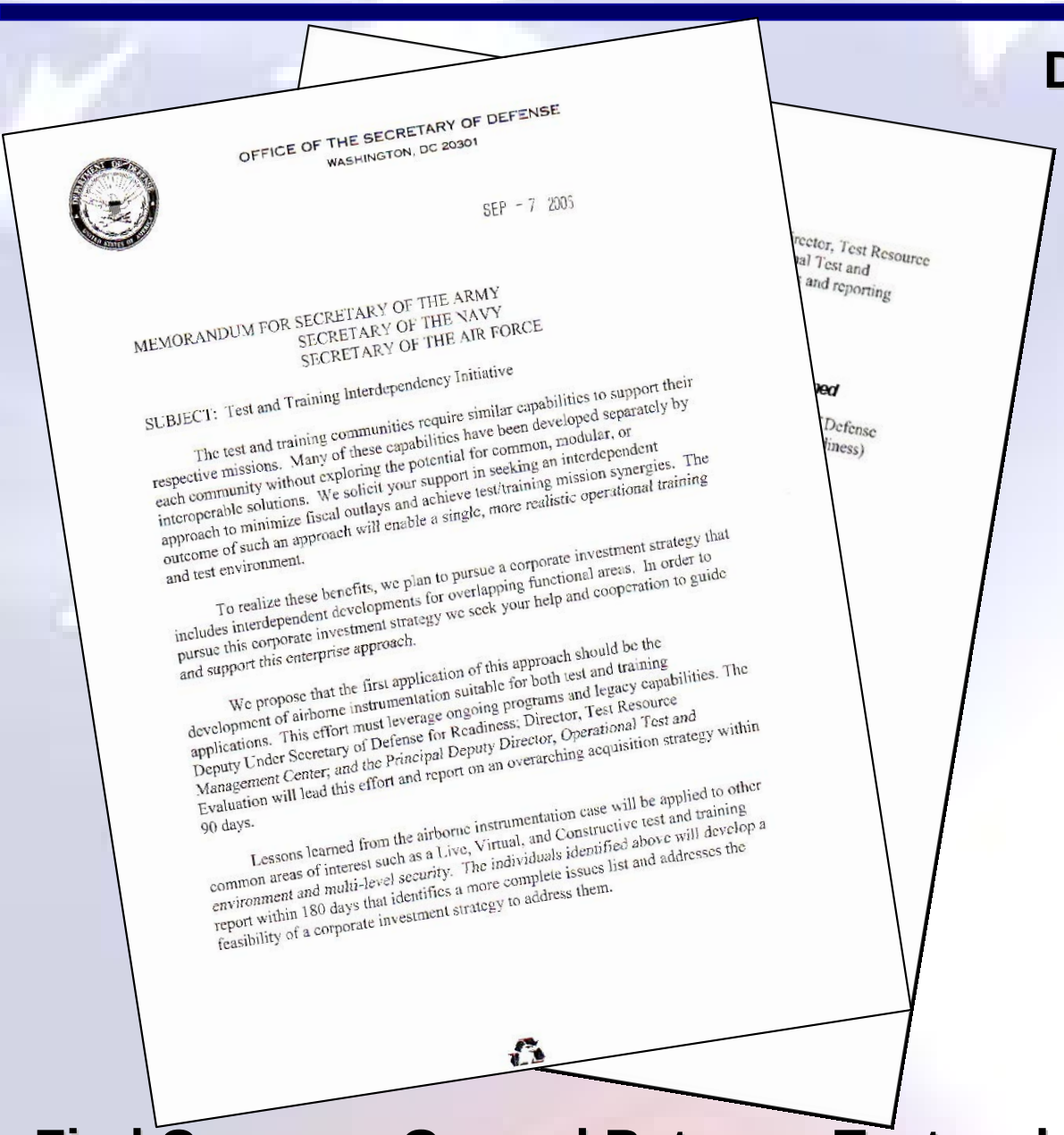
Mr. Mike Sorial
CRIIS Program Manager
850-883-3601
mike.sorial@eglin.af.mil

This briefing is: UNCLASSIFIED

Evolution of Test and Training Instrumentation



Memos, Memos Everywhere



OFFICE OF THE SECRETARY OF DEFENSE
WASHINGTON, DC 20301

SEP - 7 2005

MEMORANDUM FOR SECRETARY OF THE ARMY
SECRETARY OF THE NAVY
SECRETARY OF THE AIR FORCE

SUBJECT: Test and Training Interdependency Initiative

The test and training communities require similar capabilities to support their respective missions. Many of these capabilities have been developed separately by each community without exploring the potential for common, modular, or interoperable solutions. We solicit your support in seeking an interdependent approach to minimize fiscal outlays and achieve test/training mission synergies. The outcome of such an approach will enable a single, more realistic operational training and test environment.

To realize these benefits, we plan to pursue a corporate investment strategy that includes interdependent developments for overlapping functional areas. In order to pursue this corporate investment strategy we seek your help and cooperation to guide and support this enterprise approach.

We propose that the first application of this approach should be the development of airborne instrumentation suitable for both test and training applications. This effort must leverage ongoing programs and legacy capabilities. The Deputy Under Secretary of Defense for Readiness; Director, Test Resource Management Center; and the Principal Deputy Director, Operational Test and Evaluation will lead this effort and report on an overarching acquisition strategy within 90 days.

Lessons learned from the airborne instrumentation case will be applied to other common areas of interest such as a Live, Virtual, and Constructive test and training environment and multi-level security. The individuals identified above will develop a report within 180 days that identifies a more complete issues list and addresses the feasibility of a corporate investment strategy to address them.

Direction To Proceed with CRIIS

OFFICE OF THE SECRETARY OF DEFENSE
WASHINGTON, DC 20301

APR 06 2007

MEMORANDUM FOR AIR FORCE ACQUISITION EXECUTIVE

Subject: Test and Training Interdependency Initiative—Common Range Integrated Instrumentation System Lead Acquisition Agent

The Office of the Secretary of Defense Test and Training Interdependency Initiative memorandum dated September 7, 2006, directed the development of airborne instrumentation suitable for both test and training as the first application of a corporate strategy to pursue interdependent developments for overlapping functional areas. We request that the Deputy Program Executive Officer for Weapons at the Air Armament Center be designated the lead acquisition agent (LAA) for the development of this system under the Air Force-led Common Range Integrated Instrumentation System (CRIIS) project within the Central Test and Evaluation Investment Program (CTEIP).

The LAA must incorporate the concept of test and training technical "interdependency" into the acquisition strategy. This is defined as the development and fielding of test and training capabilities that are fiscally, functionally, and technically mutually dependent. We will conduct progress reviews on how well this interdependency is implemented in CRIIS planning and development, as well as the extent to which the project leverages ongoing test and training instrumentation developments and legacy capabilities. The CTEIP will fund developments to meet common test and training requirements and test specific requirements. Training funds (Joint and/or Service) will be used to meet requirements specific to the training community.

We ask the Air Force, as the lead Service for CRIIS, to secure agreements among participating Services to program sustainment and configuration management costs. We also request the LAA to provide [redacted] the CTEIP Program Manager, with a program plan within ninety days of this memorandum for review by our team. In closing, we would like to thank [redacted] Executive Director Air Armament Center, for her work in coordinating this important initiative.

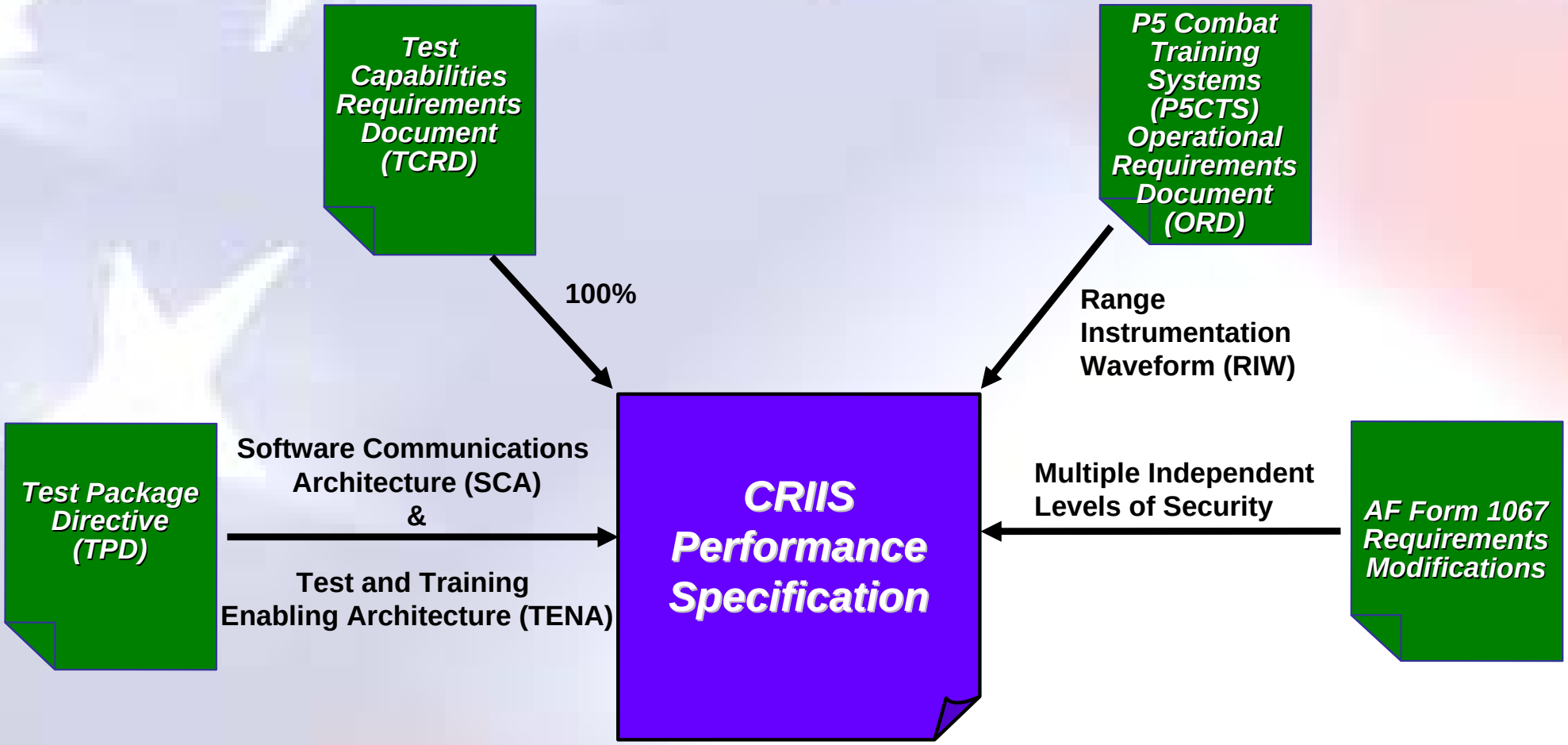
Original Signed
Deputy Under Secretary of Defense
for Readiness
OUSD(P&R)

Original Signed
Principal Deputy Director
Operational Test and Evaluation

Original Signed
Director
Test Resource Management Center
OUSD(AT&L)

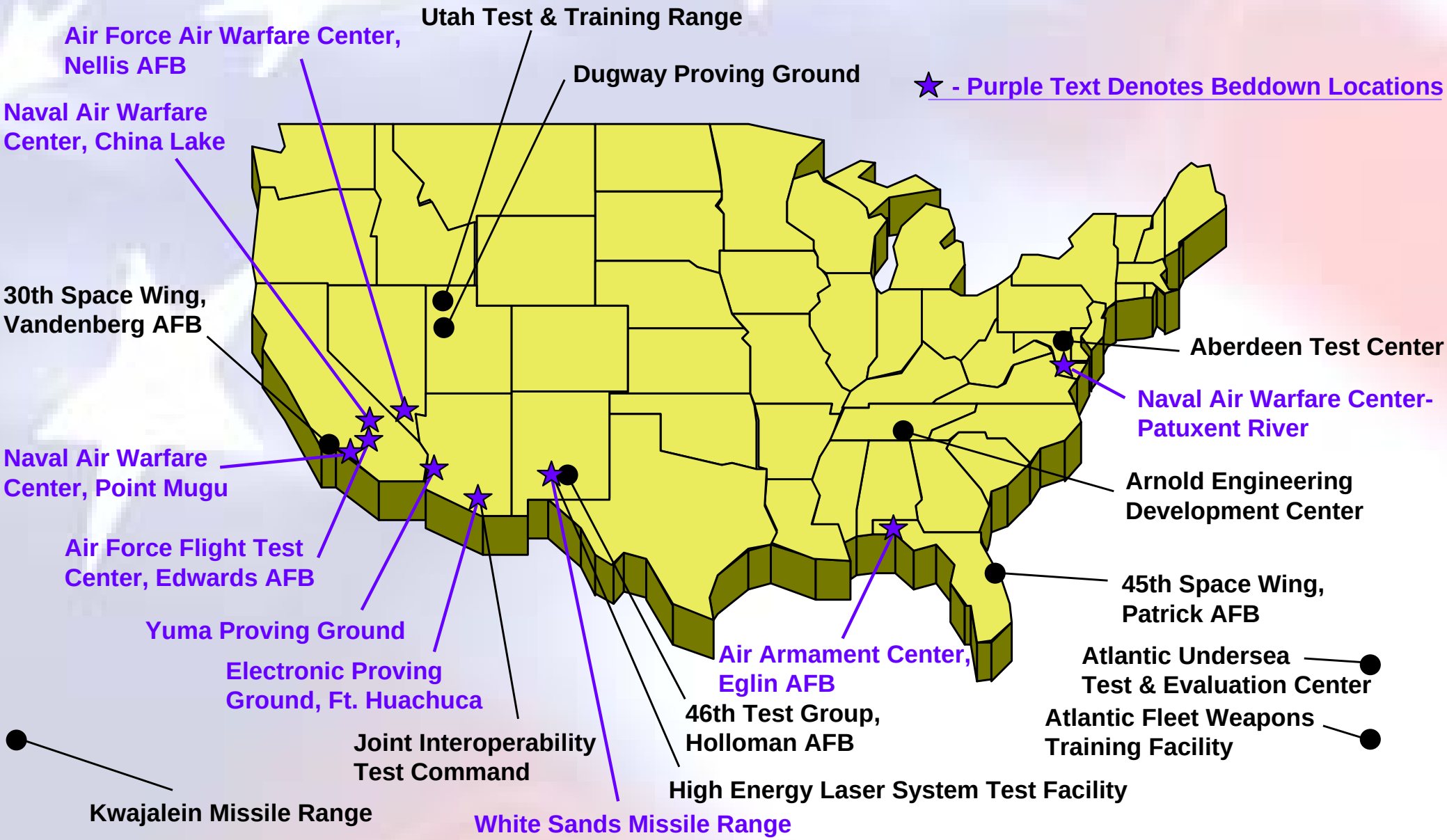
Find Common Ground Between Test and Training Instrumentation

Requirements Relationships

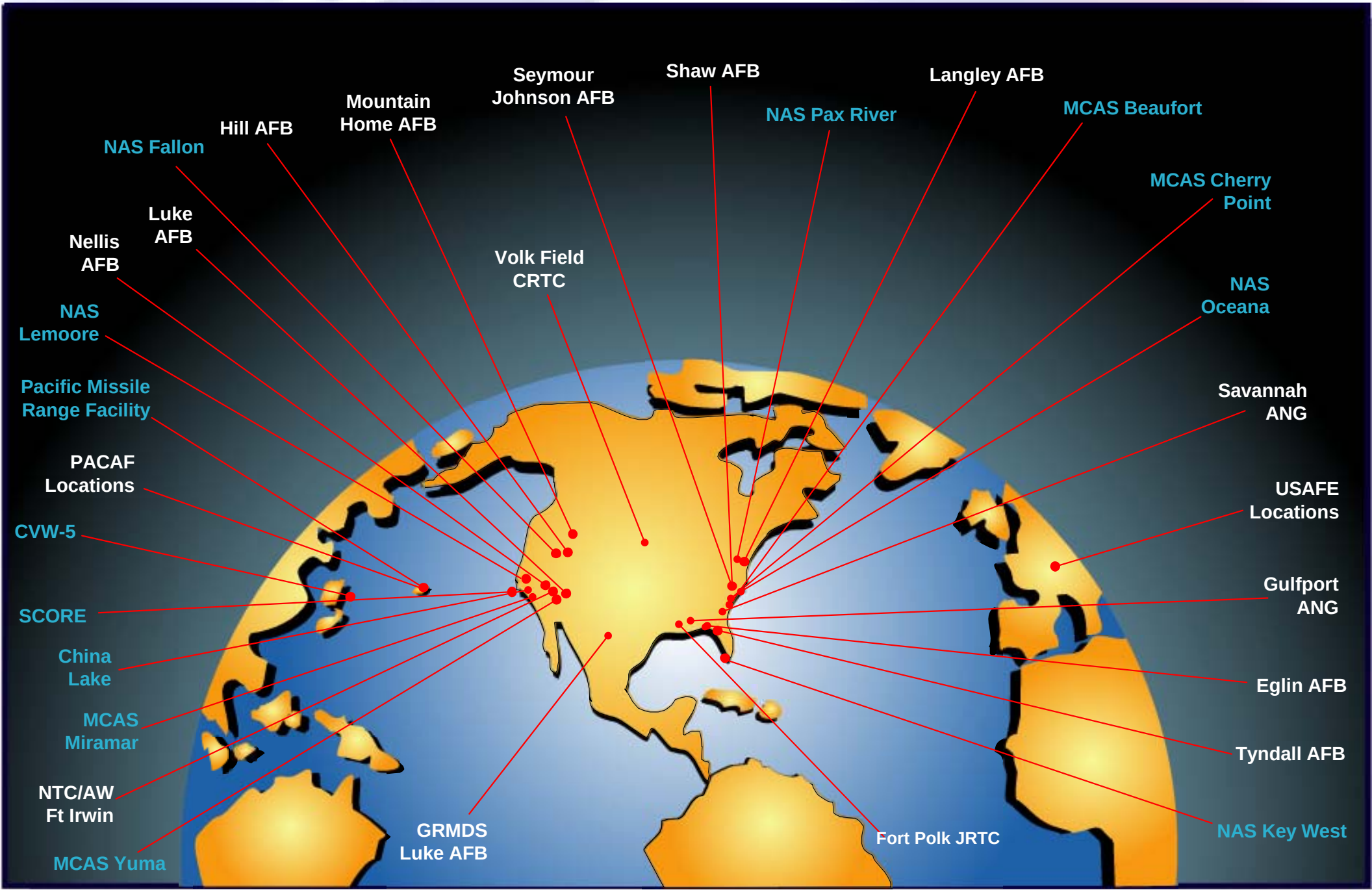


Managed by Requirements Control Working Group

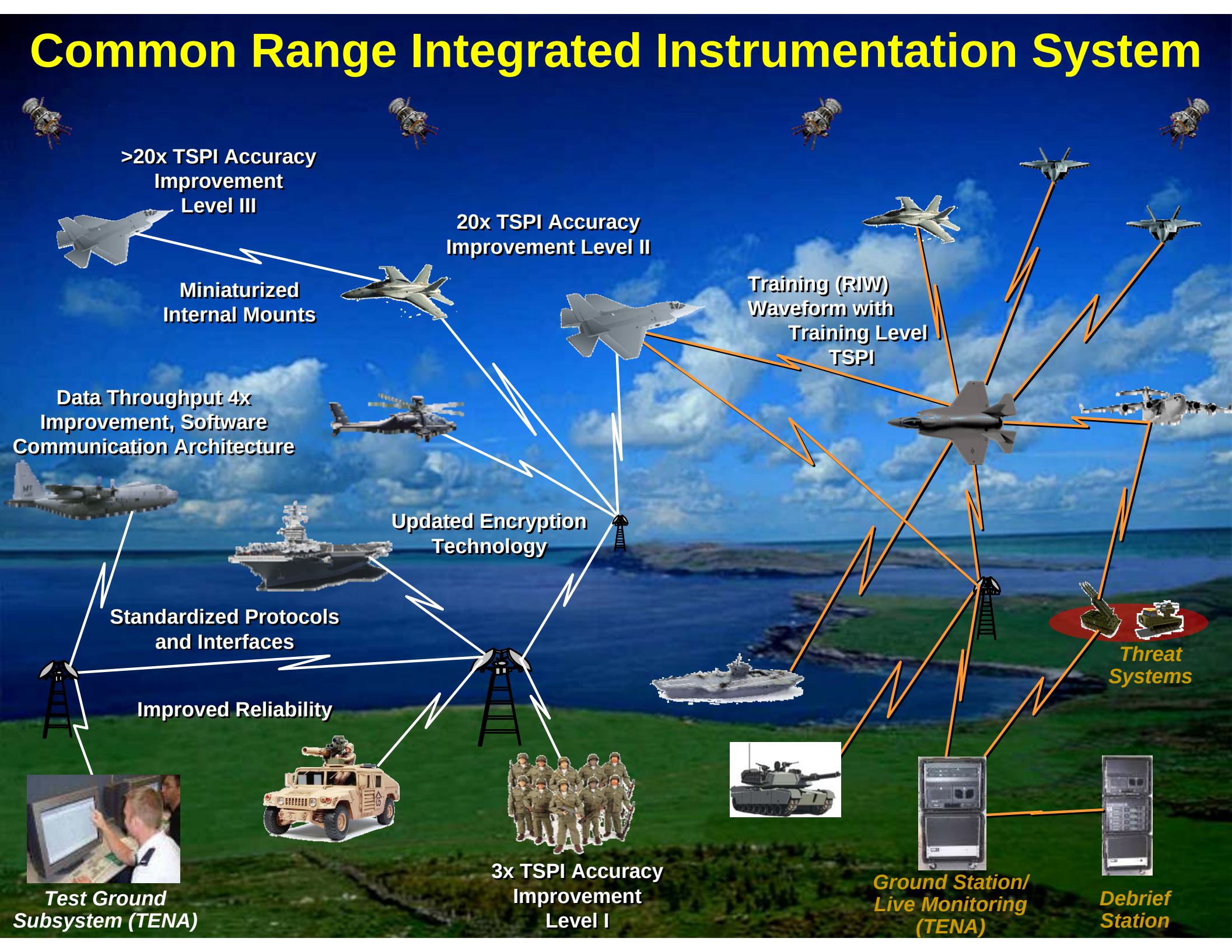
Major Range and Test Facility Base (MRTFB) and Initial Beddown Location



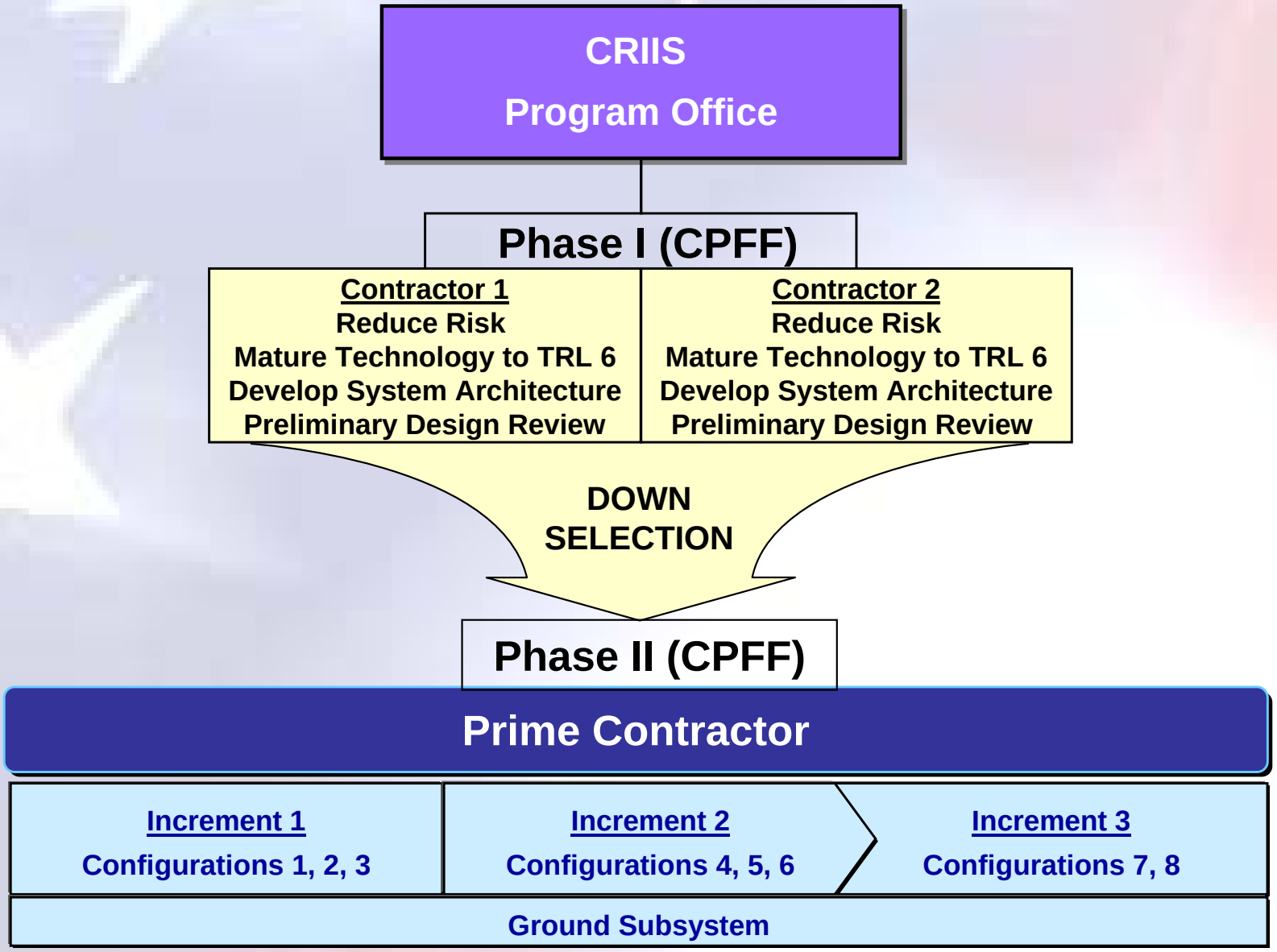
Where We Train Today



Common Range Integrated Instrumentation System



Program Acquisition Approach



CRIIS Increments & Configurations

Training and Test

INCREMENT 1

Configurations 1, 2, 3

Level IA TSPI
Short Range DL

Config. 1
Dismounted Soldier

Level IB TSPI
Mid Range DL
Encryption

Config. 2
Low Dynamic Vehicles

Config. 3
Ship-to-Shore

Level IB TSPI
Extended Range DL

INCREMENT 2

Configurations 4, 5, 6

Level II TSPI
High Throughput DL
Encryption

Config. 4 Pod

Config. 5 Moderate Accuracy
Multi-Package Internal Mount

Config. 6 Moderate Accuracy
Single Package Internal Mount

RIW/Training Hooks

INCREMENT 3

Configurations 7, 8

Config. 7 High Accuracy
Multiple-Package Internal Mount

Level III TSPI
High Throughput DL
Encryption

Config. 8 High Accuracy
Single Package Internal Mount

Ground Subsystem (GS)

Architecture Approach

TSPI Building Blocks
- Level I A
- Level I B
- Level II
- Level III
- Absolute Mode

DATALINK Building Blocks
- Short Range
- Mid Range
- Extended Range
- High Throughput

OTHER Building Blocks
- Encryption Device — RIW
- Recorders
- Participant Interface Controller
- Other Training Hooks (RTKN, Weapon Sims)

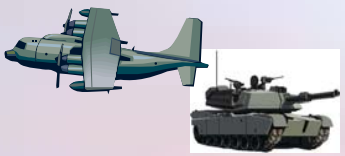
Common Framework
- Mechanical Interface
- Electrical Interface
- Data Formats & Protocols

Dismounted Soldier
Configuration #1

COMMON FRAMEWORK
- Level I A
- Short Range
- Recorders
- Participant Interface Controller

Low-Dynamic Vehicle
Configuration #2

COMMON FRAMEWORK
- Level I B
- Mid Range
- Encryption Device
- Recorders
- Participant Interface Controller



Ship-to-Shore
Configuration #3

COMMON FRAMEWORK
- Level I B
- Extended Range
- Recorders
- Participant Interface Controller

Moderate Accuracy
Configuration #4: POD
Configuration #5: 2-box IM
Configuration #6: 1-box IM

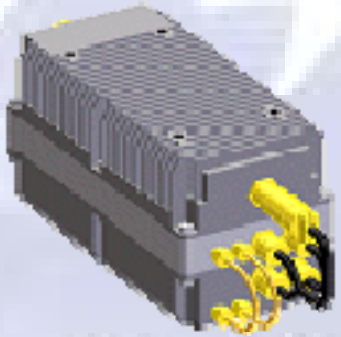
COMMON FRAMEWORK
- Level II — Absolute Mode
- High Throughput — RIW
- Encryption Device — RIW
- Recorders
- Participant Interface Controller — RIW
- Other Training Hooks (RTKN, Weapon Sims)

High Accuracy
Configuration #7: 2-box IM
Configuration #8: 1-box IM

COMMON FRAMEWORK
- Level III
- High Throughput
- Encryption Device
- Recorders
- Participant Interface Controller

Ground Subsystem

Key Technologies



Datalink

Antenna

GPS Receiver Module

Recording Device

Encryption Device

Antenna

Participant Interface Unit

Inertial Measurement Unit

Ground Subsystem

Key Working Groups

Test & Training Enabling Architecture (TENA)

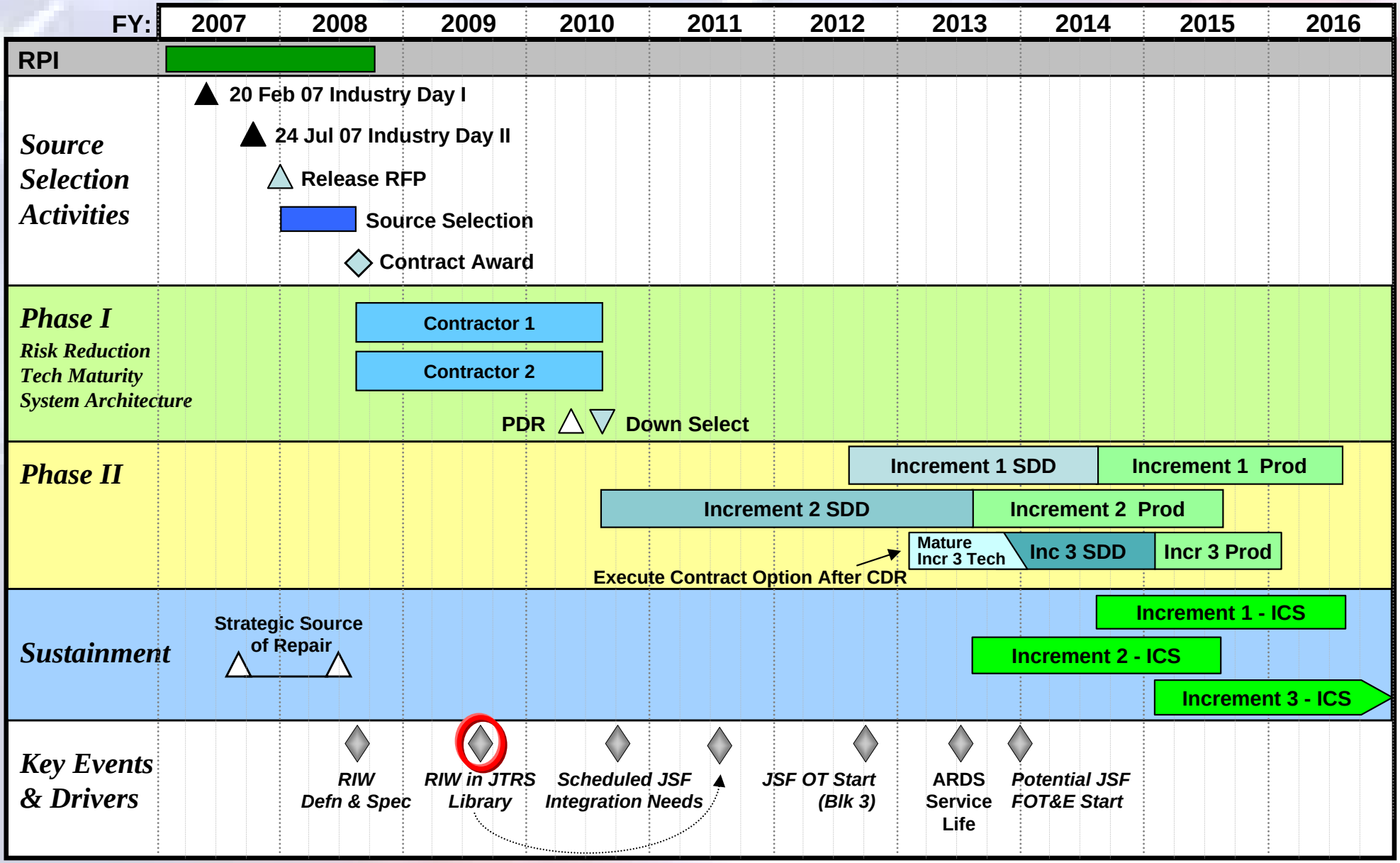
Integrated Test Team

System Security

Joint Tactical Radio System (JTRS)

Frequency Allocation

CRIIS Program Schedule



Test & Training Approach

Phase II

INCREMENT 2

Configurations 4, 5, 6

Level II TSPI

High Throughput DL

Encryption

Config. 4 Pod

Config. 5 Moderate Accuracy Multi-Package Internal Mount

Config. 6 Moderate Accuracy Single Package Internal Mount

MILS

+

"The Hooks"

Participant Interface Controller (PIC) Delta

DLT RIW Capable

PORT RIW

TSPI

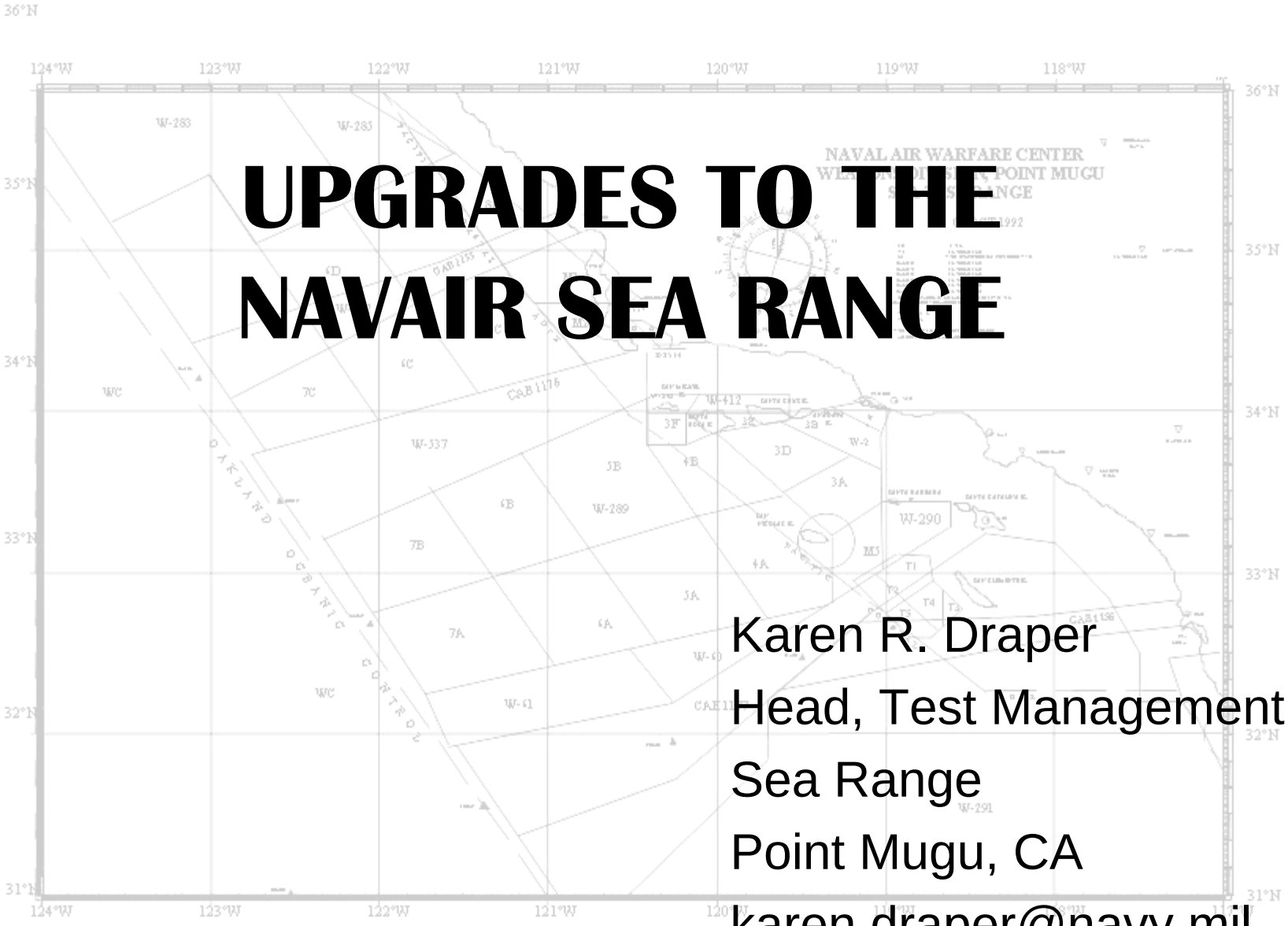
Training Debrief

Enables Testing (OT/FDE/TDE) in a Training Environment "Interoperability"

Basic CRIIS System

Summary

- Maturing Technology Readiness
- Lowering Integration Risks
- Maximizing Open Architecture for Future Growth
- Interoperability with Training Achieved Through Datalink



UPGRADES TO THE NAVAIR SEA RANGE

Karen R. Draper
Head, Test Management
Sea Range
Point Mugu, CA
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Outline

- NAVAIR RANGES OVERVIEW
  - ATLANTIC TEST RANGE
  - LAND RANGE
    - NORTH RANGE
    - SOUTH RANGE
    - ELECTRONIC COMBAT RANGE
  - SEA RANGE
- UPGRADE PROJECTS
  - COMMON DISPLAY SYSTEM
  - RANGE TIMING AND DATA INFRASTRUCTURE RE-ENGINEERING
  - TELEMETRY
  - RADAR
  - OPERATIONAL CONTROL ROOM MIKE
  - NEXT GENERATION RANGE SUPPORT AIRCRAFT

Ranges Department Mission

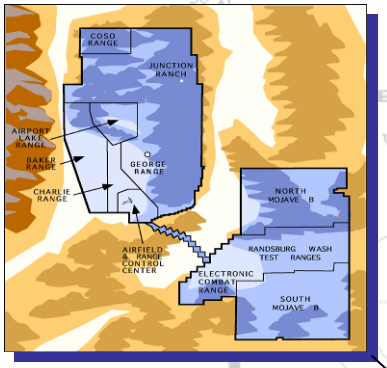
NAVAIR Ranges – Leaders in providing decision-quality data in support of Sea power 21 and the war fighters.

We…

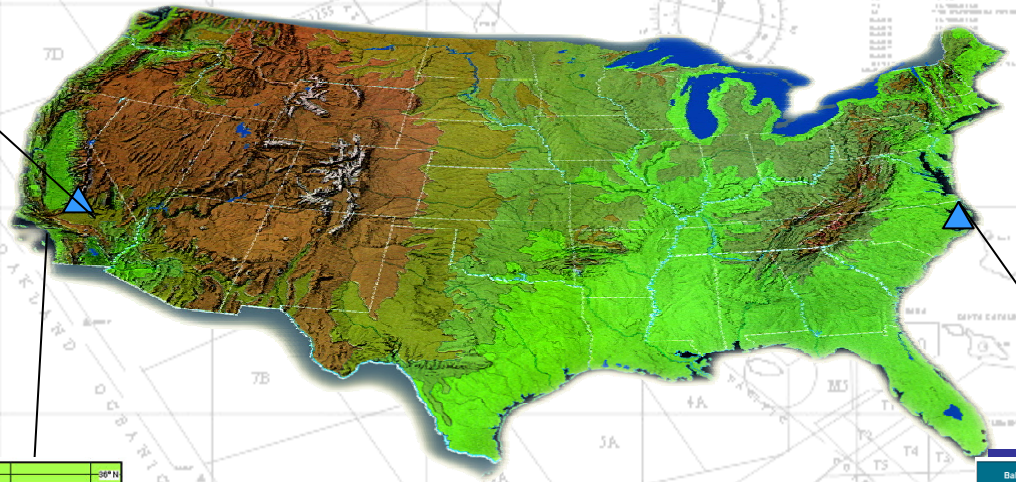
- ***Develop, operate, manage and sustain interoperable air, land and sea ranges, range instrumentation and associated facilities.***
- ***Provide air vehicle and weapons systems modification and instrumentation.***
- ***Schedule and control air, land, sea space and associated range-operating areas.***

NAVAIR RANGES

A National Competancy

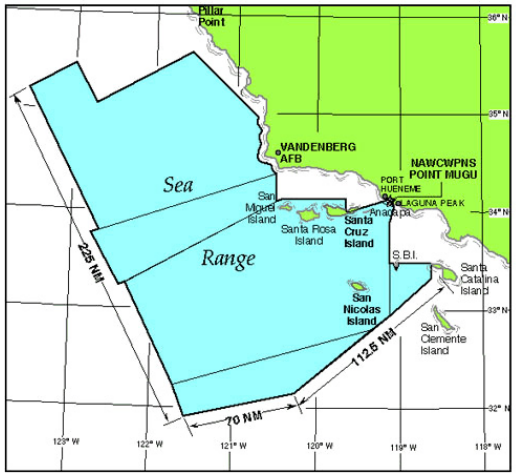


China Lake

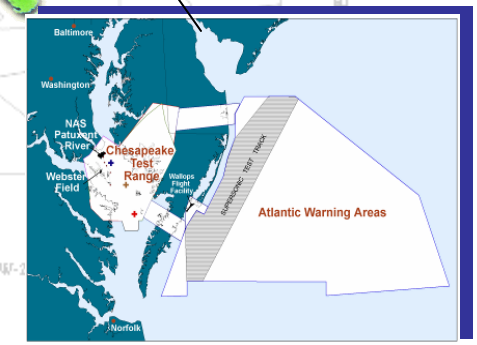


Aircraft Division

Weapons Division



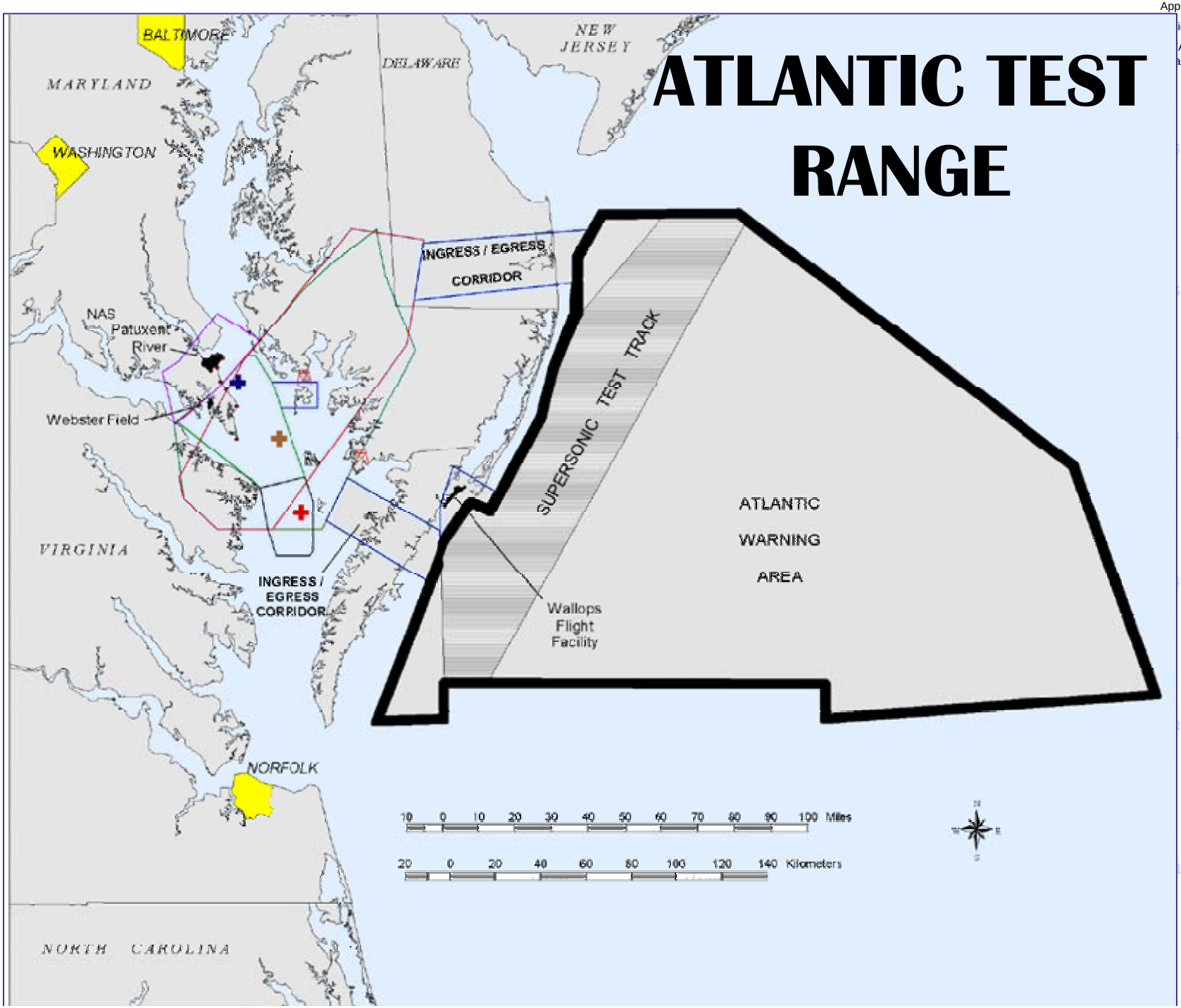
Point Mugu



Patuxent River

Recognized Technical Expertise

- Complex weapon system and software integration
  - Weaponized systems to the fleet
- Energetic materials and subsystems
- Interoperability of warfare systems
- Laser and optical components
- Modeling and Simulation
- 50+ years weapons T&E
- 40 years Electronic Warfare
- 30+ years of Laser Damage work
- 25 years of RCS
- 15 years of GPS jamming
- Live Fire Test Directorate testing of early HPM systems since the mid-90s



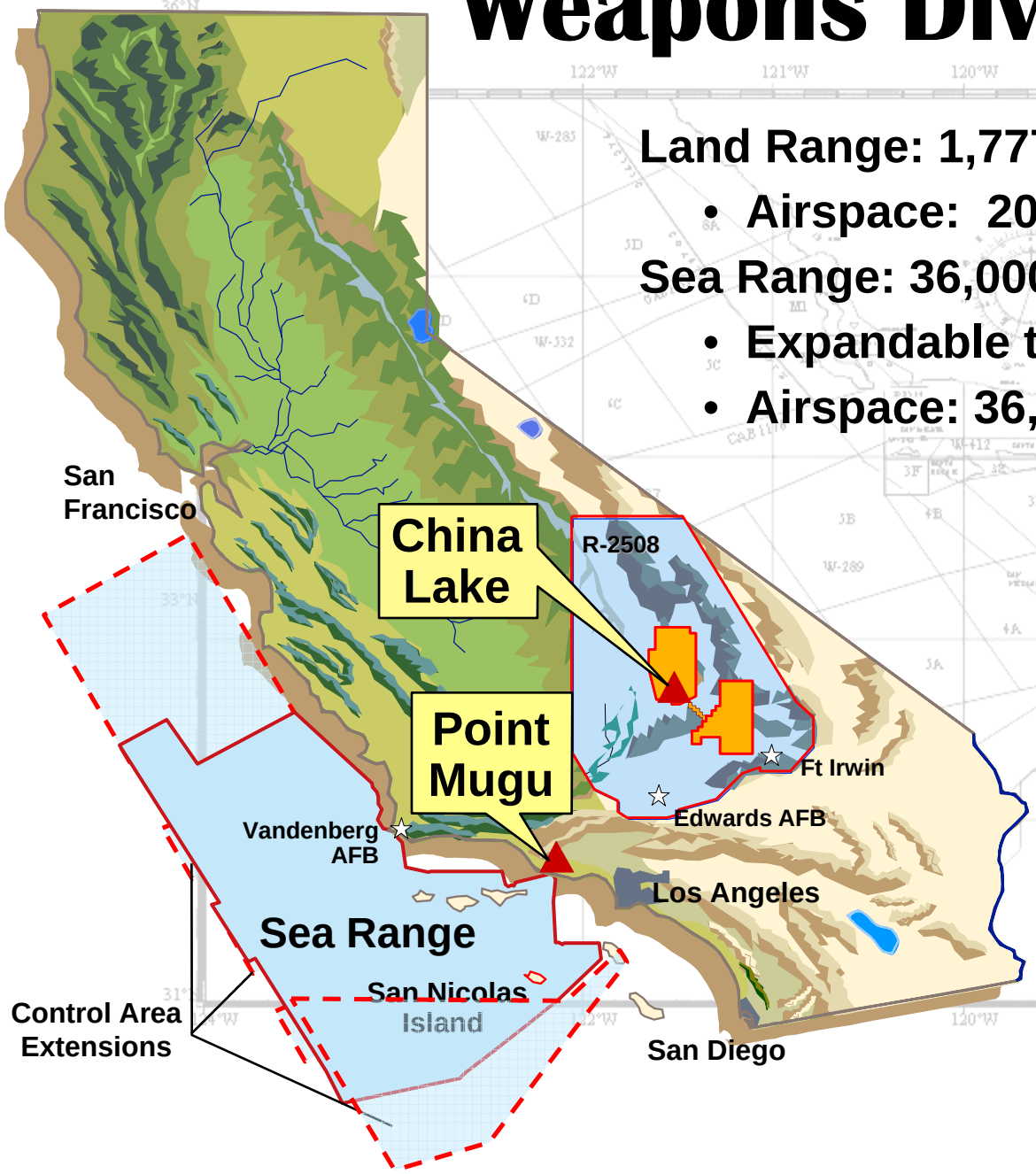
Weapons Division Ranges

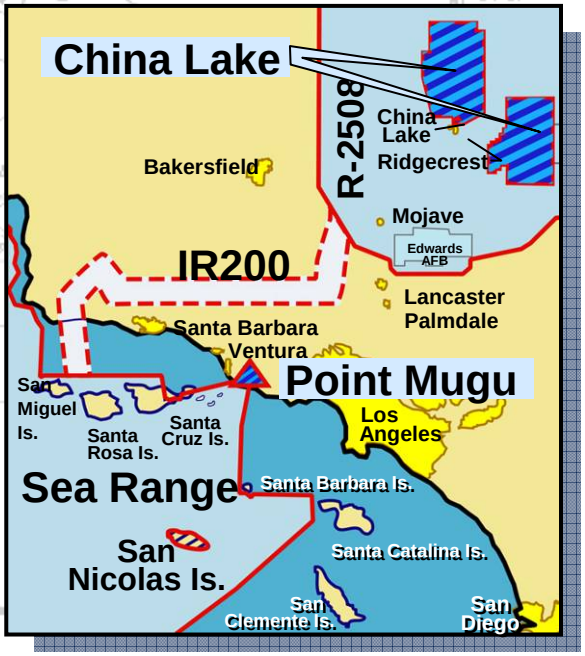
Land Range: 1,777 square miles

- **Airspace: 20,000 square miles**

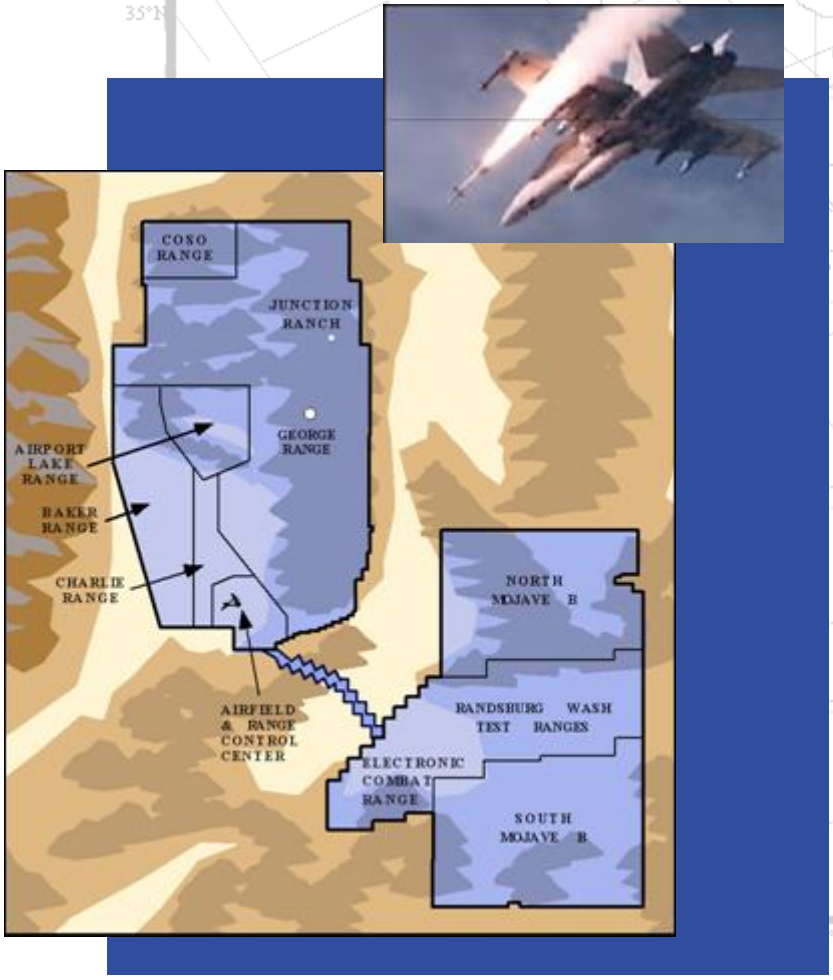
Sea Range: 36,000 square miles

- **Expandable to 125,000 square miles**
- **Airspace: 36,000 square miles**





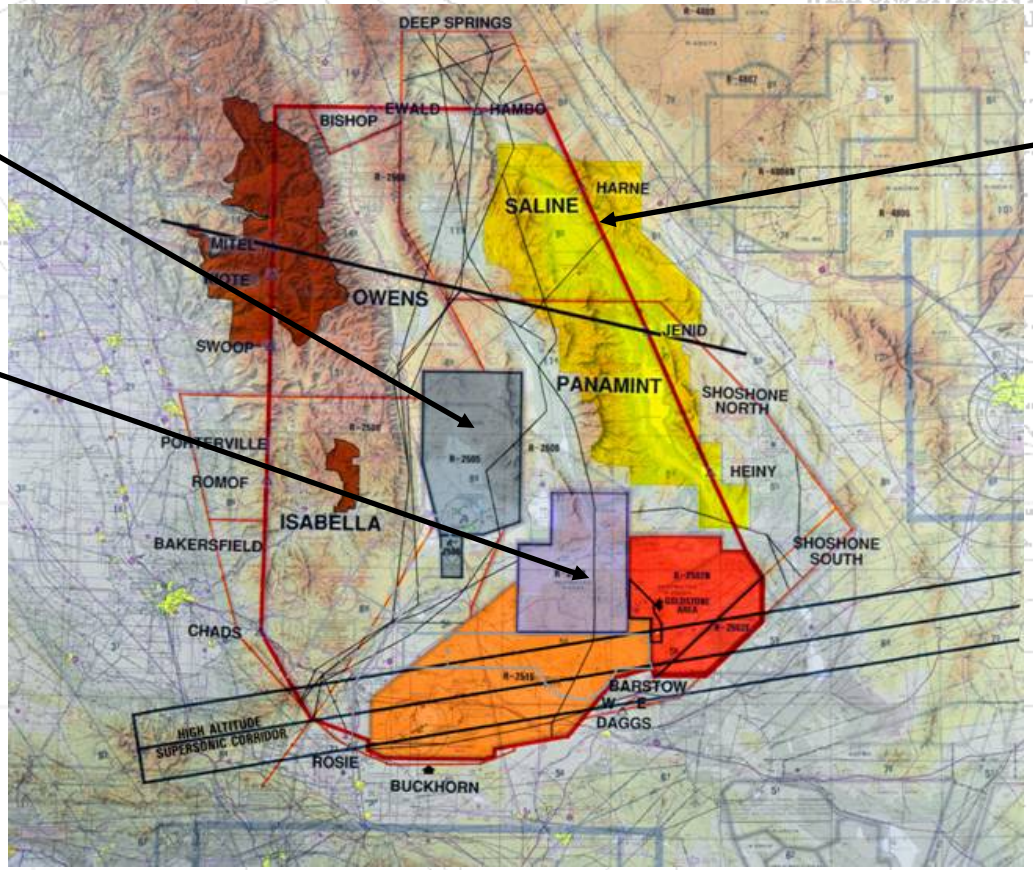
China Lake Land Range Complex



- Realistic air / land operational environment
- Dry environment environment with no ducting issues
- Signal monitoring facilities, fixed and mobile
- 1,722 sq mi of land space
- 17,000 sq mi of controlled airspace
- Instrumentation
  - TSPI, telemetry, optical, communications, ...
- Air, land, and arm targets
- Ordnance storage, handling, and assembly facilities
- Range safety, security, and environmental support
- Secured HPM facility

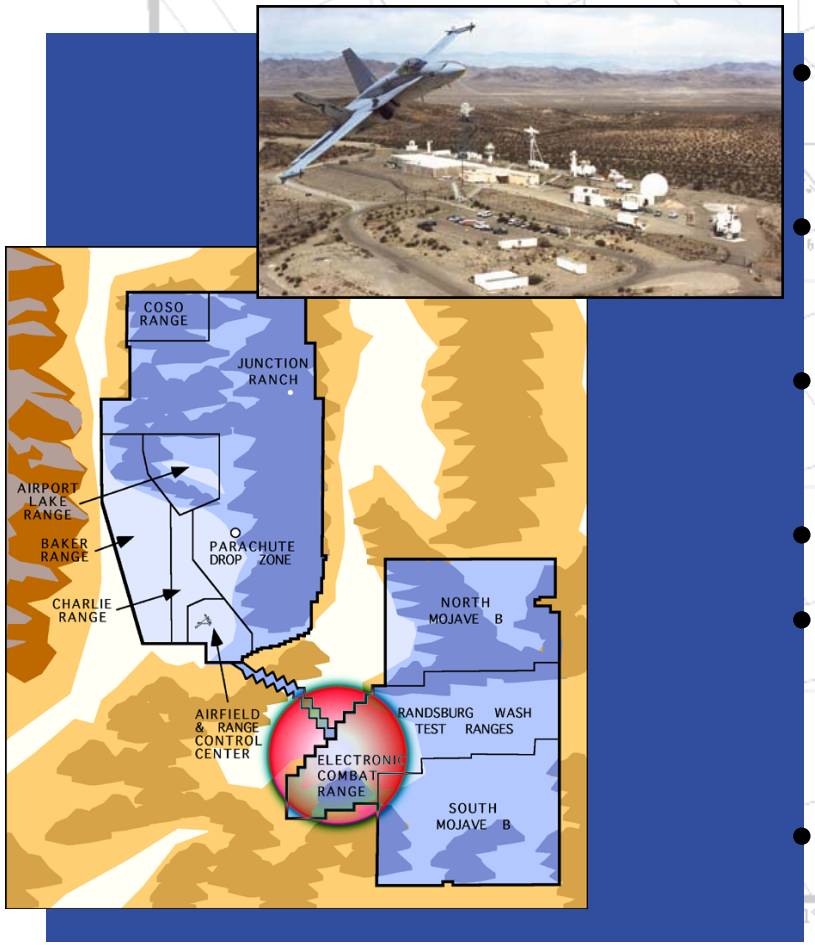
Airspace Control – R2508

Secured airspace in R-2505 and R-2524 from ground level up



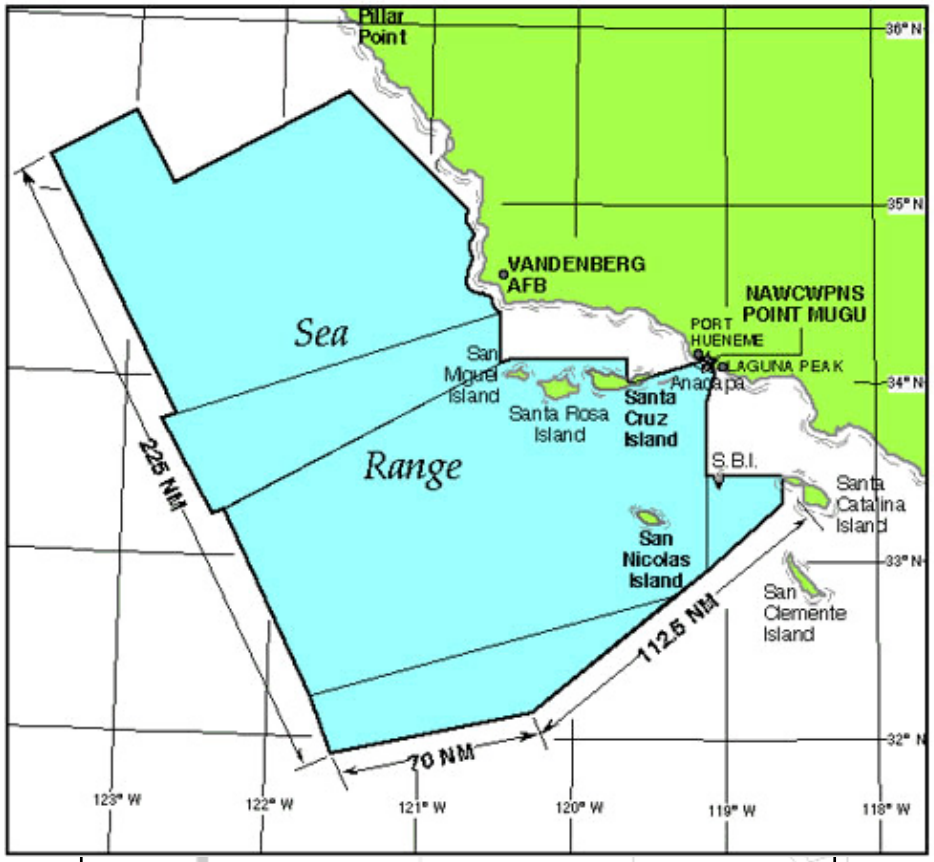
Restricted airspace in R-2508 from 20K ft and up.

Electronic Combat Range



- Resident on China Lake South Range
- Realistic electronic combat environment
- One of 10 facilities involved in IO testing
- Threat Systems (13 acquisition, 23 SAM, 7 AAA, 1 C2)
- Operations and Range Control
- Instrumentation
  - TSPI, telemetry, optical, communications
- Signal monitoring and calibration system
- Foreign Material Exploitation facilities

Point Mugu Sea Range



- Realistic sea operational environment
  - High humidity ducting environment
- Laser Testing, both airborne and ground based
- Signal monitoring facilities, fixed and mobile
- Secure offshore island
- 36,000 sq mi of controlled sea / airspace
- 125,000 sq mi instrumented sea / airspace
- Extensive instrumentation
  - TSPI, telemetry, communications, geophysics
- Air, sea, littoral targets
- Range safety, security, and environmental support

Airspace Control

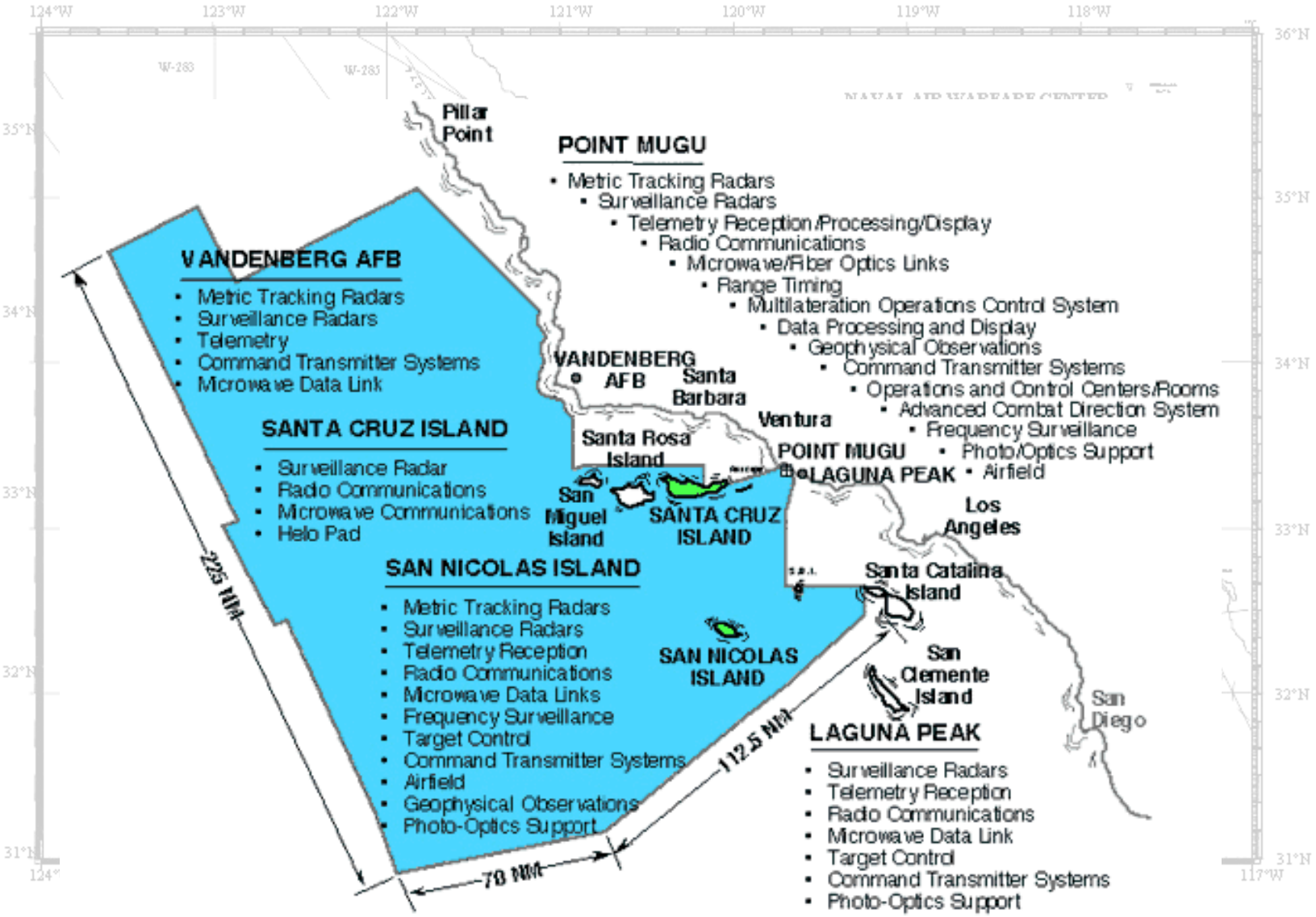
- NAVAIR WD is scheduling authority for Sea Range airspace, including Restricted Airspace over SNI
- Can close two of the three air corridors with FAA concurrence

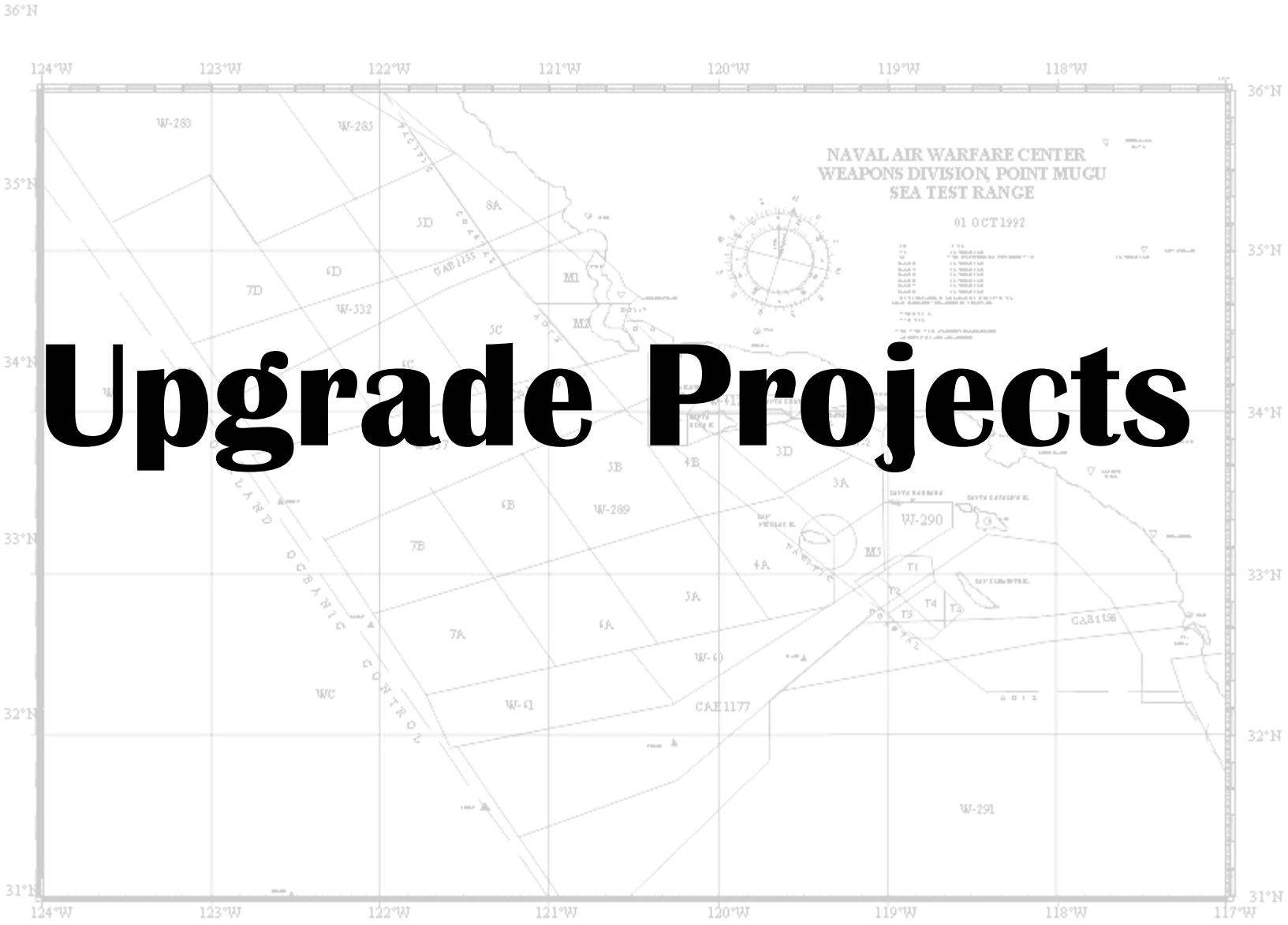
San Nicolas Island

- Entire island has been under Navy ownership since 1933
- Airfield: 10,000 foot airfield with daily scheduled passenger & logistics flights
- Connectivity: High Bandwidth fiber optic infrastructure to Pt Mugu & other DoD ranges

- 60 miles off shore
- Secure facility / hanger
- Strike Ops: Inert impact area
- SOF Ops: Beach landing areas
- Can conducted Laser test across body of water, land to land

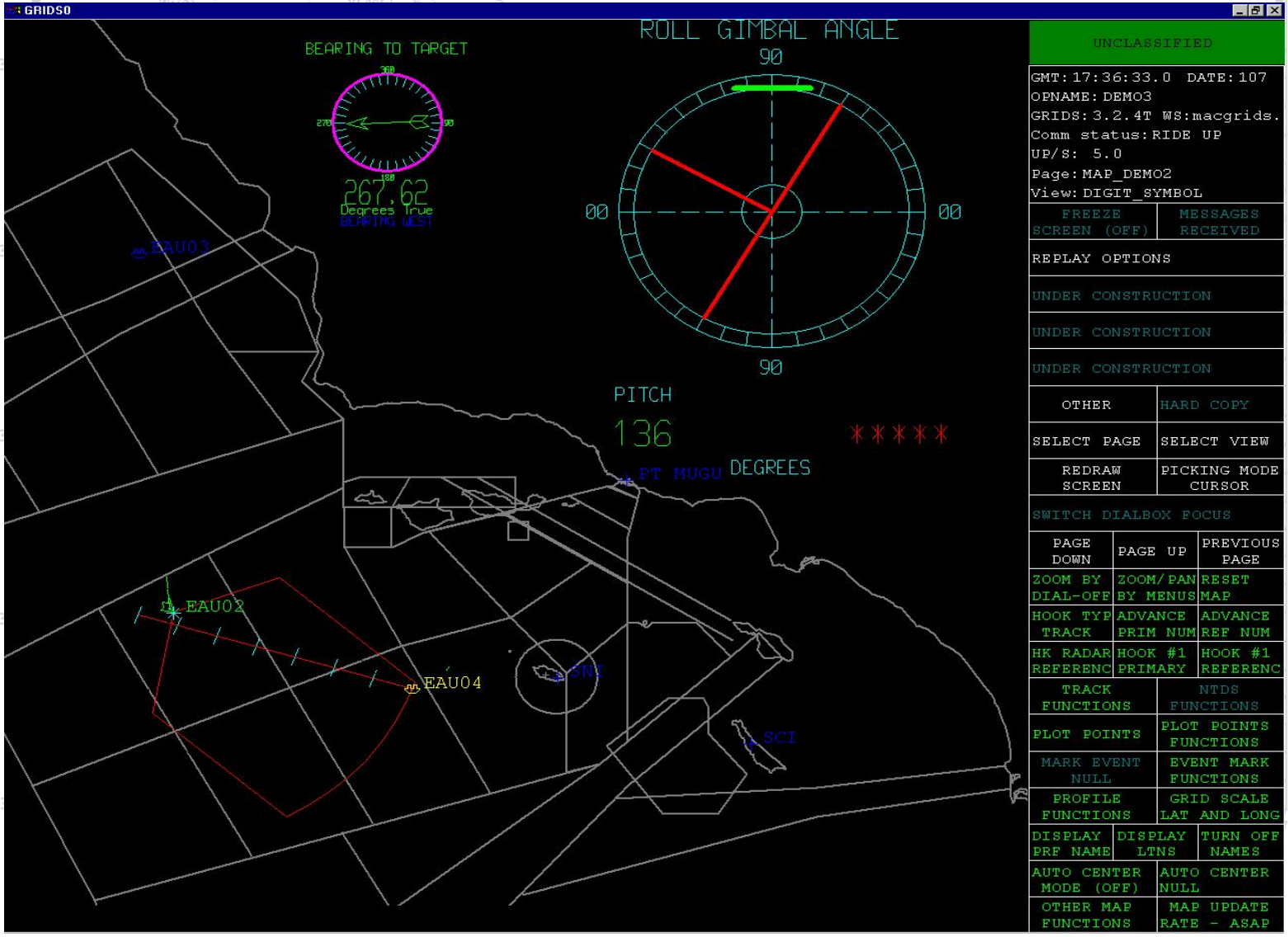
Instrumentation





Upgrade Projects

Common Display System (CDS)



Current Situation

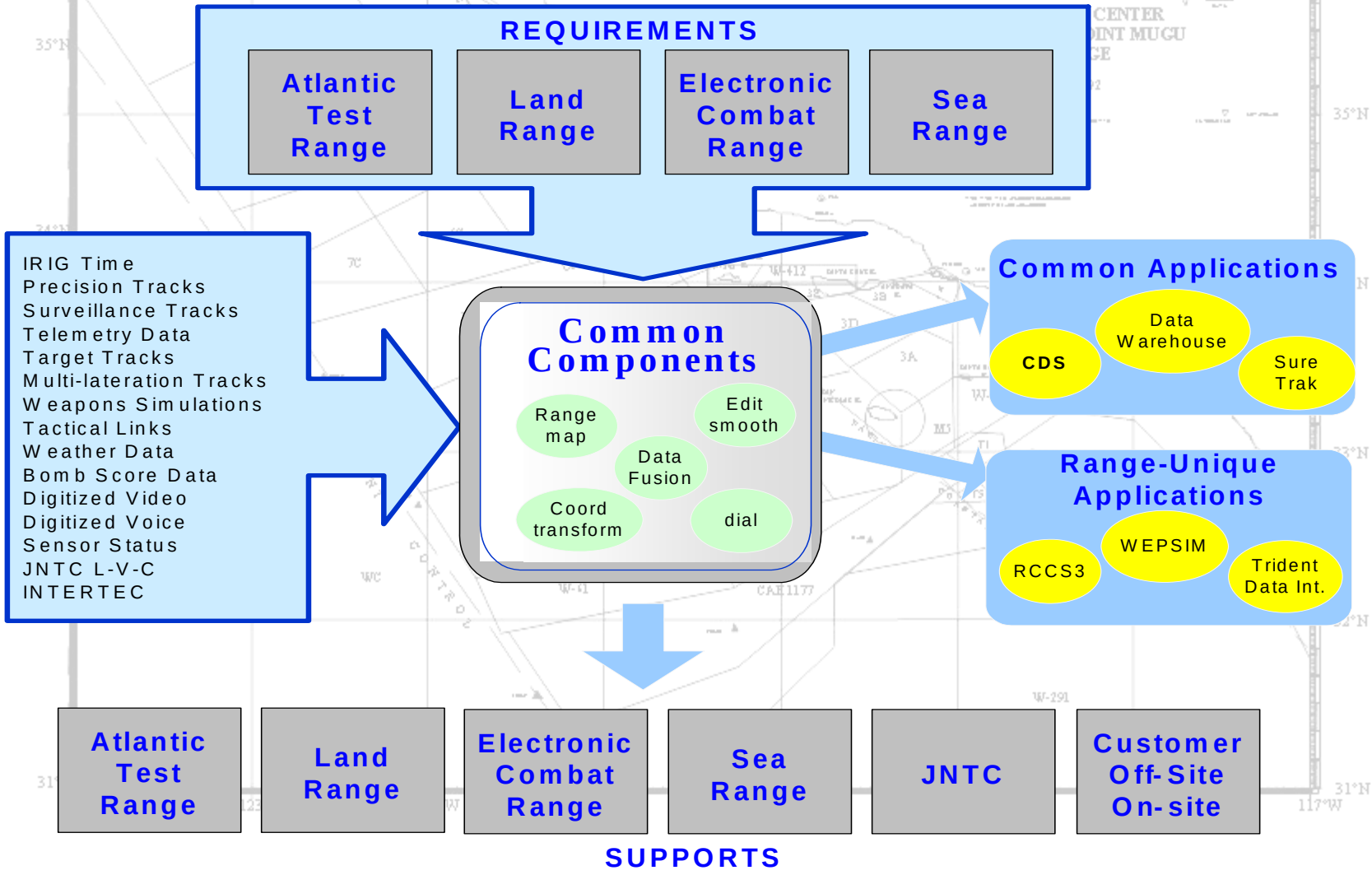
- **Western Ranges utilize multiple display systems for TSPI & TM:**

Range	TSPI	TM
Land	RCCS-II	DataViews, DAVES-III, RangeView
Sea	GRIDS	GRIDS, DataViews, RangeView
ECR	TECCS, ECR_Display	Storm_TM, RangeView, AN/ALR-67 Display, ECR_Display
EAFB	TECCS	IADS

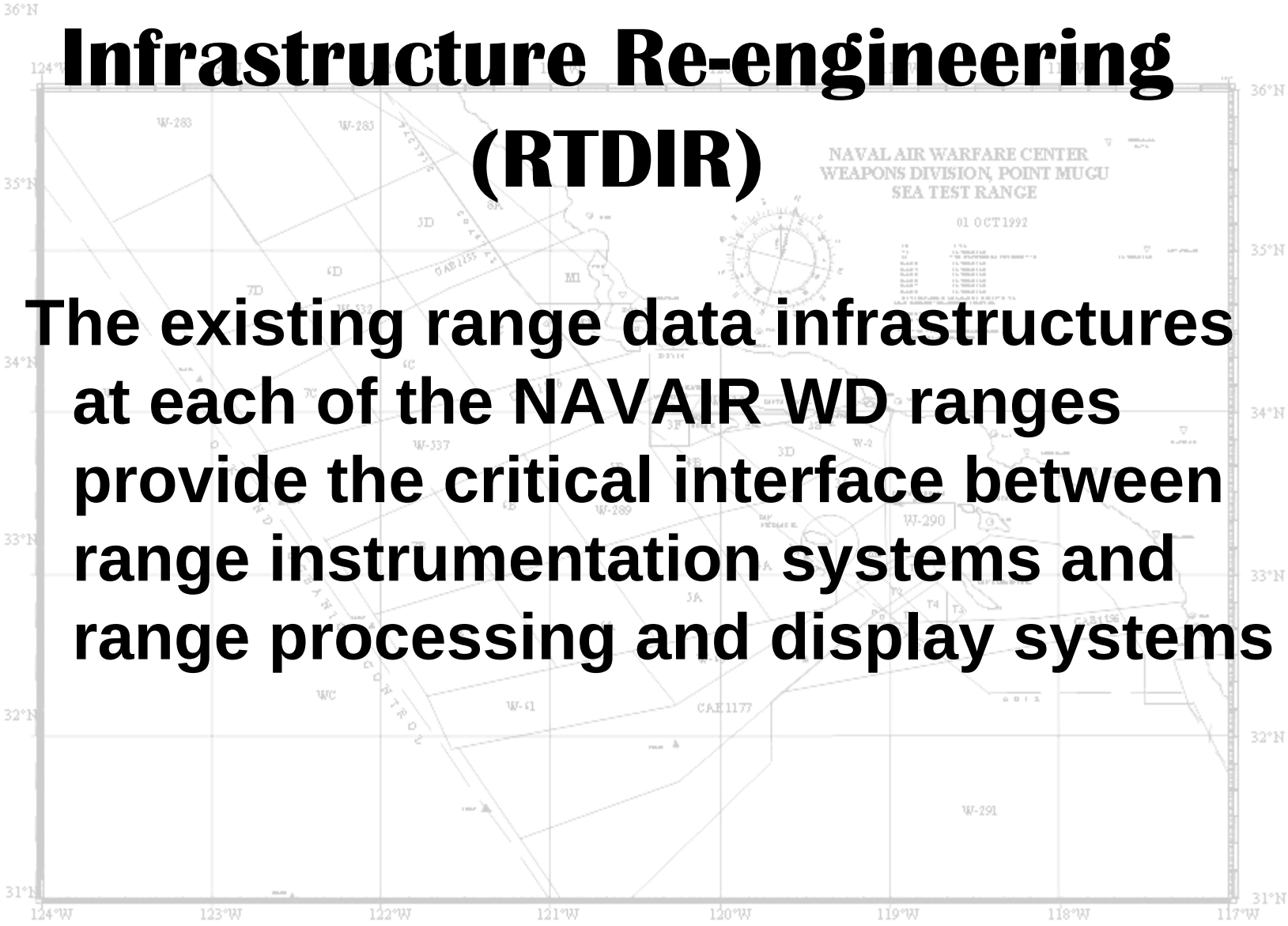
CDS Core Functionality

- Real Time Test Conduct and Display
- 3-D and 2-D TSPI Display
- Real Time Telemetry Display
- Real Time TSPI Computational Functions
- Real Time Data Archive
- Near-Real Time Data Products
- Real Time Networked Communications
- Threat Entity Interface and Control
- Data playback on customer desktop

The "Big Picture"

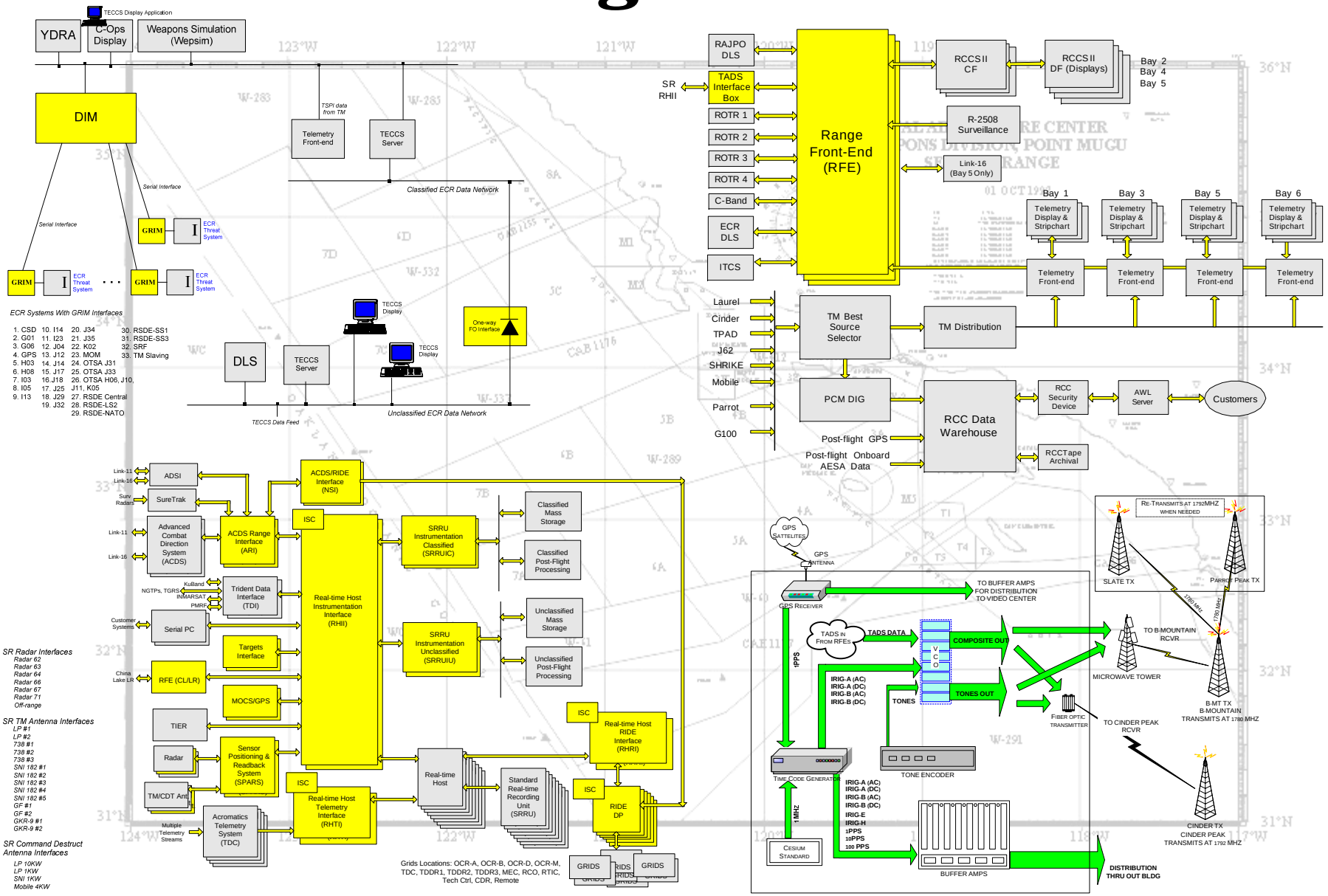


Range Timing and Data Infrastructure Re-engineering (RTDIR)



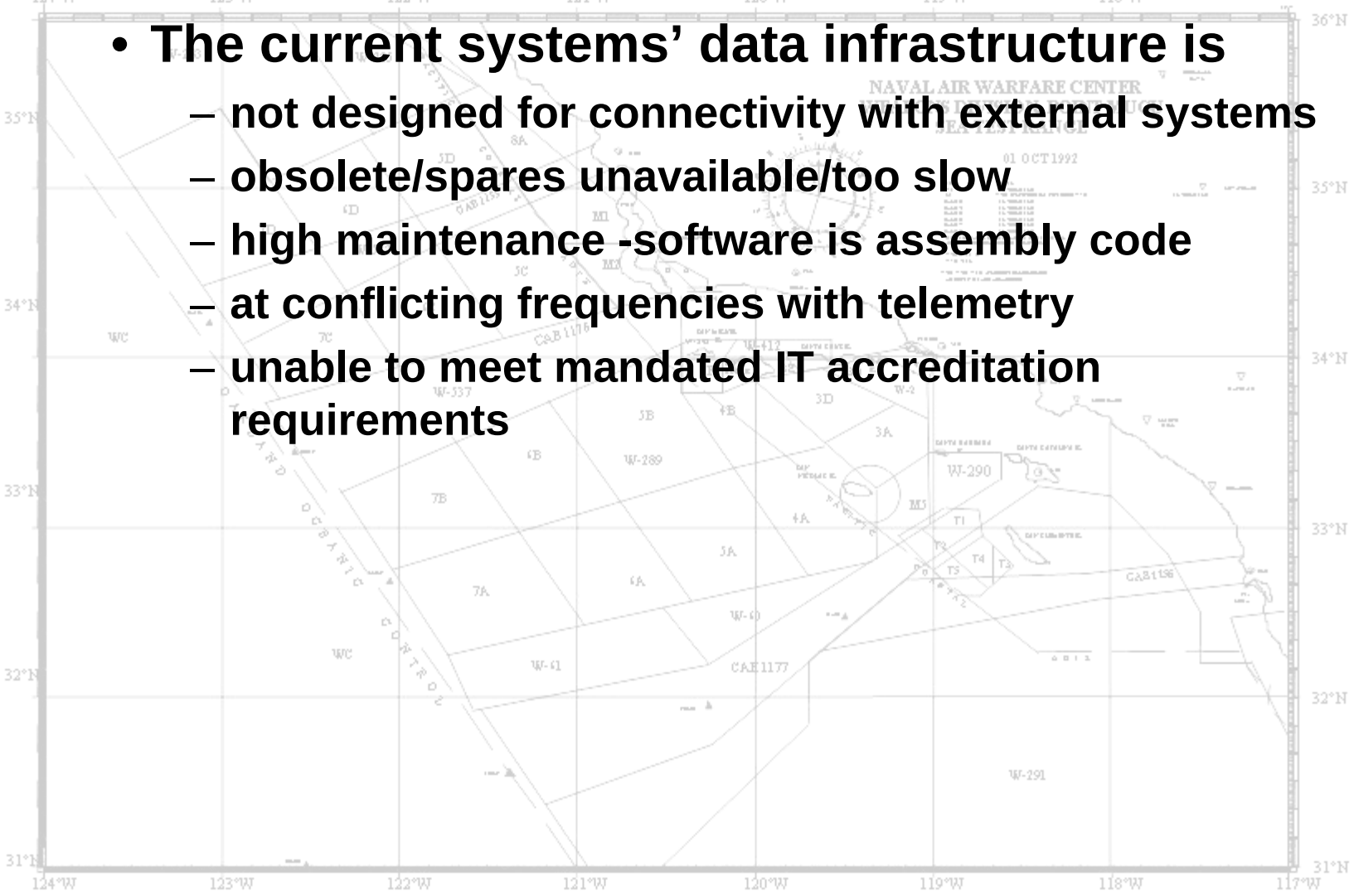
The existing range data infrastructures at each of the NAVAIR WD ranges provide the critical interface between range instrumentation systems and range processing and display systems

Current Range Architectures

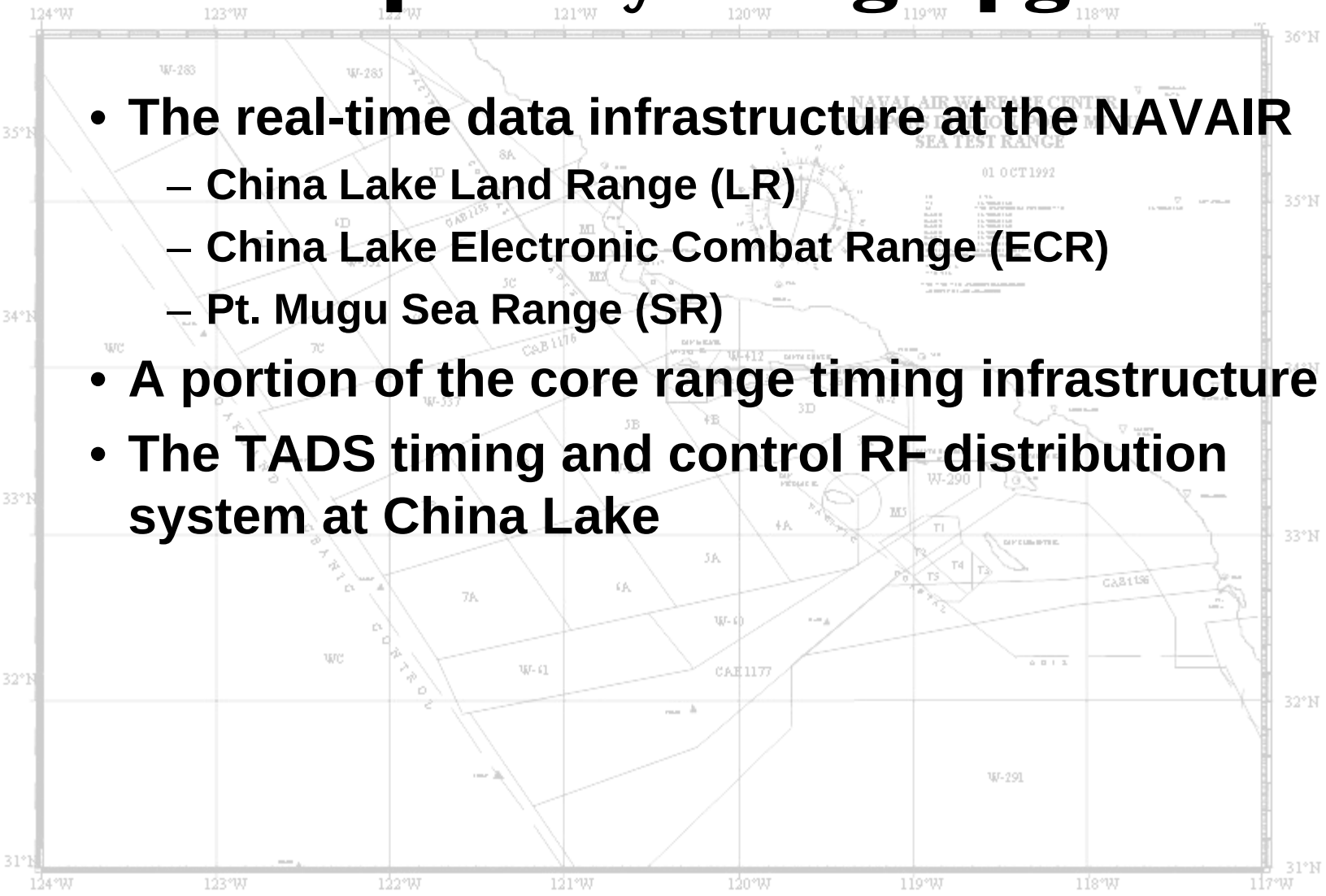


Why Upgrade?

- **The current systems' data infrastructure is**
  - **not designed for connectivity with external systems**
  - **obsolete/spares unavailable/too slow**
  - **high maintenance -software is assembly code**
  - **at conflicting frequencies with telemetry**
  - **unable to meet mandated IT accreditation requirements**



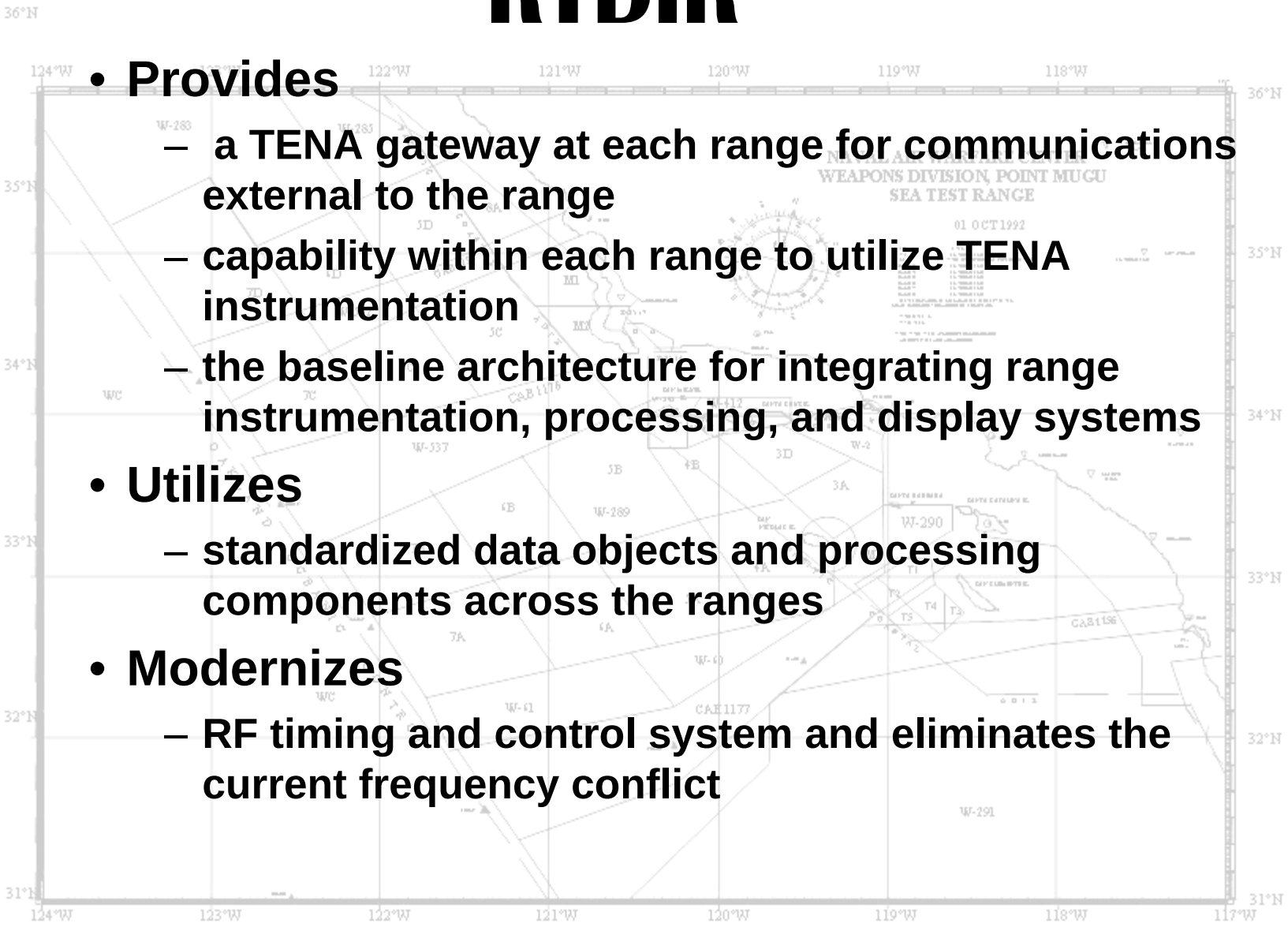
Current Capability being Upgraded



- The real-time data infrastructure at the NAVAIR
  - China Lake Land Range (LR)
  - China Lake Electronic Combat Range (ECR)
  - Pt. Mugu Sea Range (SR)
- A portion of the core range timing infrastructure
- The TADS timing and control RF distribution system at China Lake

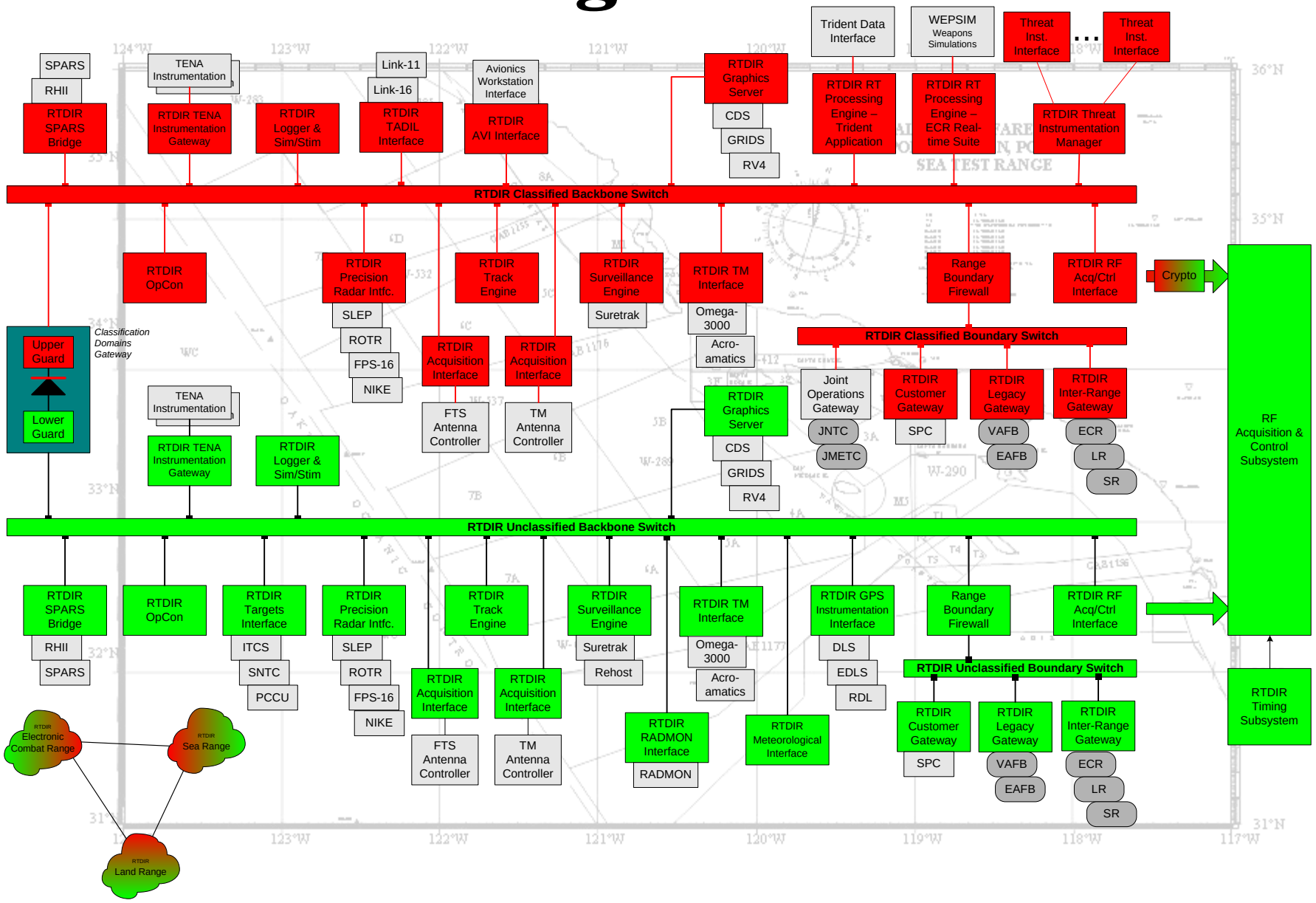
RTDIR

- **Provides**
  - **a TENA gateway at each range for communications external to the range**
  - **capability within each range to utilize TENA instrumentation**
  - **the baseline architecture for integrating range instrumentation, processing, and display systems**
- **Utilizes**
  - **standardized data objects and processing components across the ranges**
- **Modernizes**
  - **RF timing and control system and eliminates the current frequency conflict**

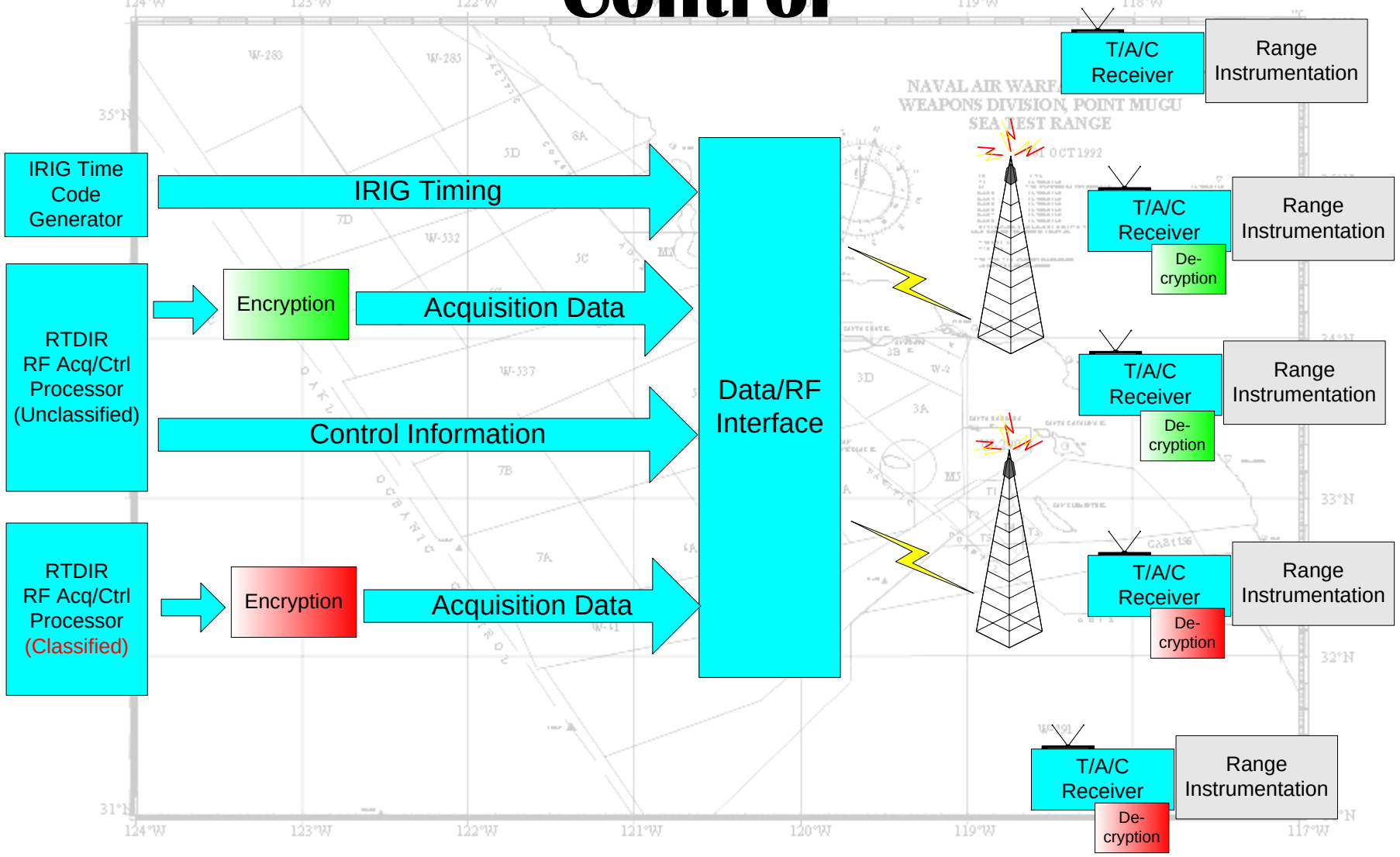


Approved for
Public Release
NAVAIR Public
Affairs Office

RTDIR Range Architecture

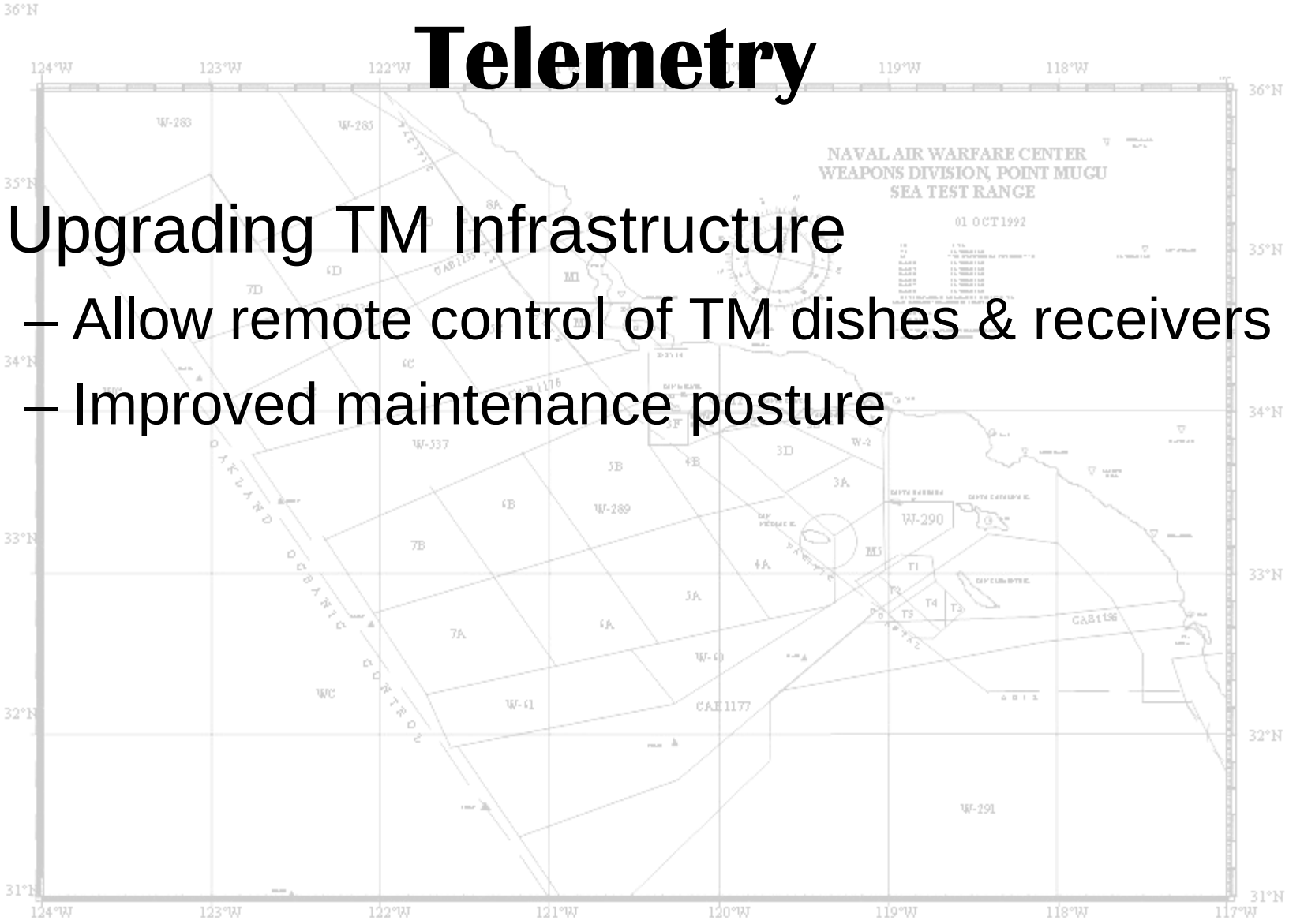


RTDIR RF Timing, Acquisition, & Control



Telemetry

- Upgrading TM Infrastructure
  - Allow remote control of TM dishes & receivers
  - Improved maintenance posture

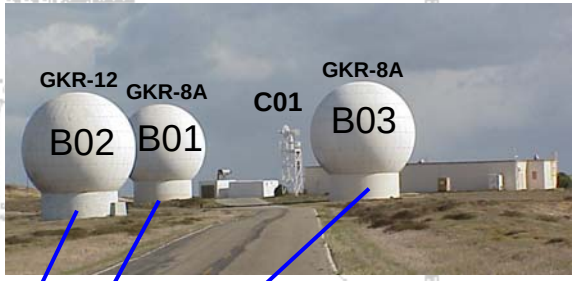


TM Locations

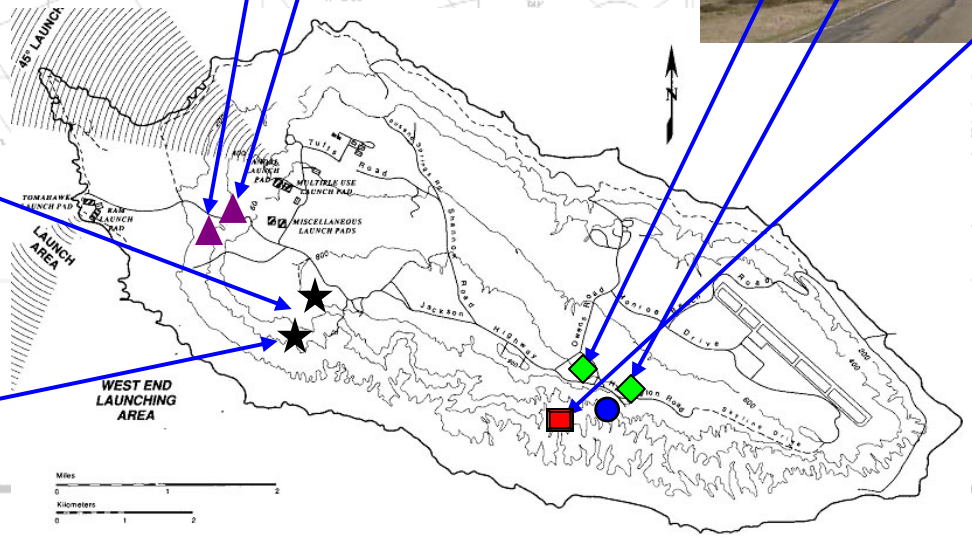
San Nicolas Island (SNI)

EMP-050-8 8’ Antennas

Bldg 182 30’ Antennas



SKR-1 20’ Antennas



TM Function Moves

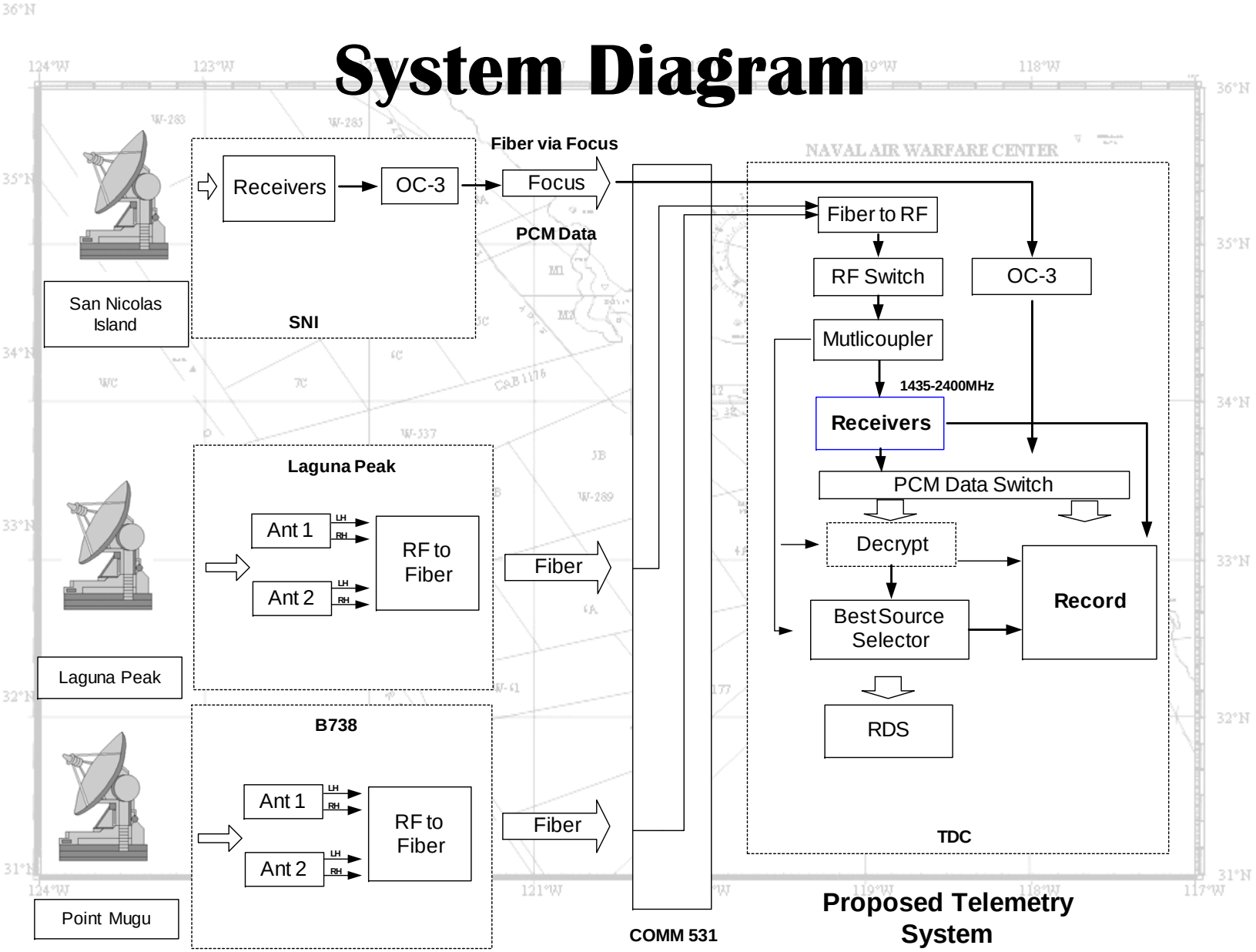
Pt Mugu

Bldg 53D

Bldg 919 GKR-13

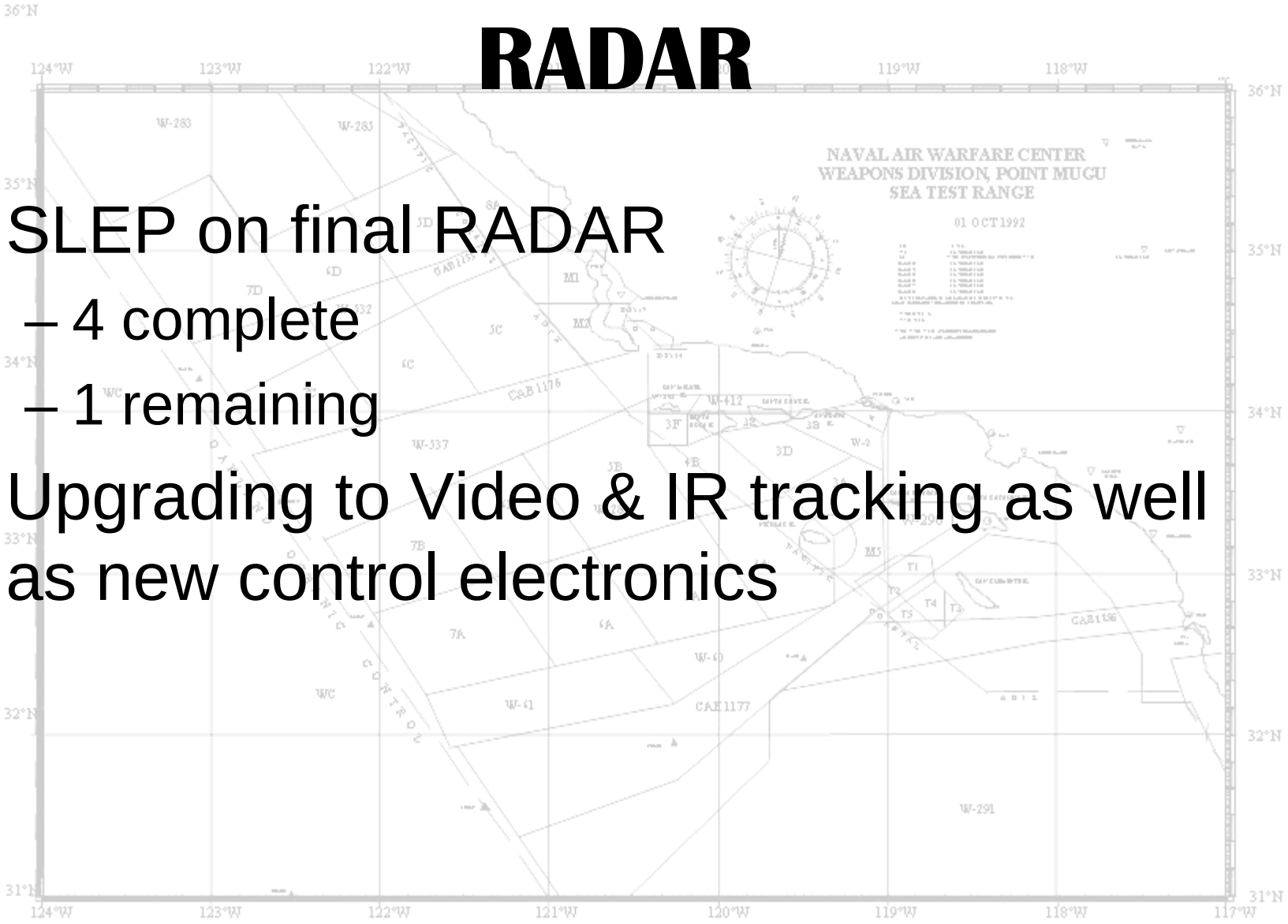
Bldg 738

System Diagram



RADAR

- SLEP on final RADAR
  - 4 complete
  - 1 remaining
- Upgrading to Video & IR tracking as well as new control electronics



Sea Range Current Capabilities

SNI RADAR ROW
Radar 62
Radar 63
Radar 64

POINT MUGU RADAR ROW
Radar 71
Radar 72

Point Mugu

Radar 67

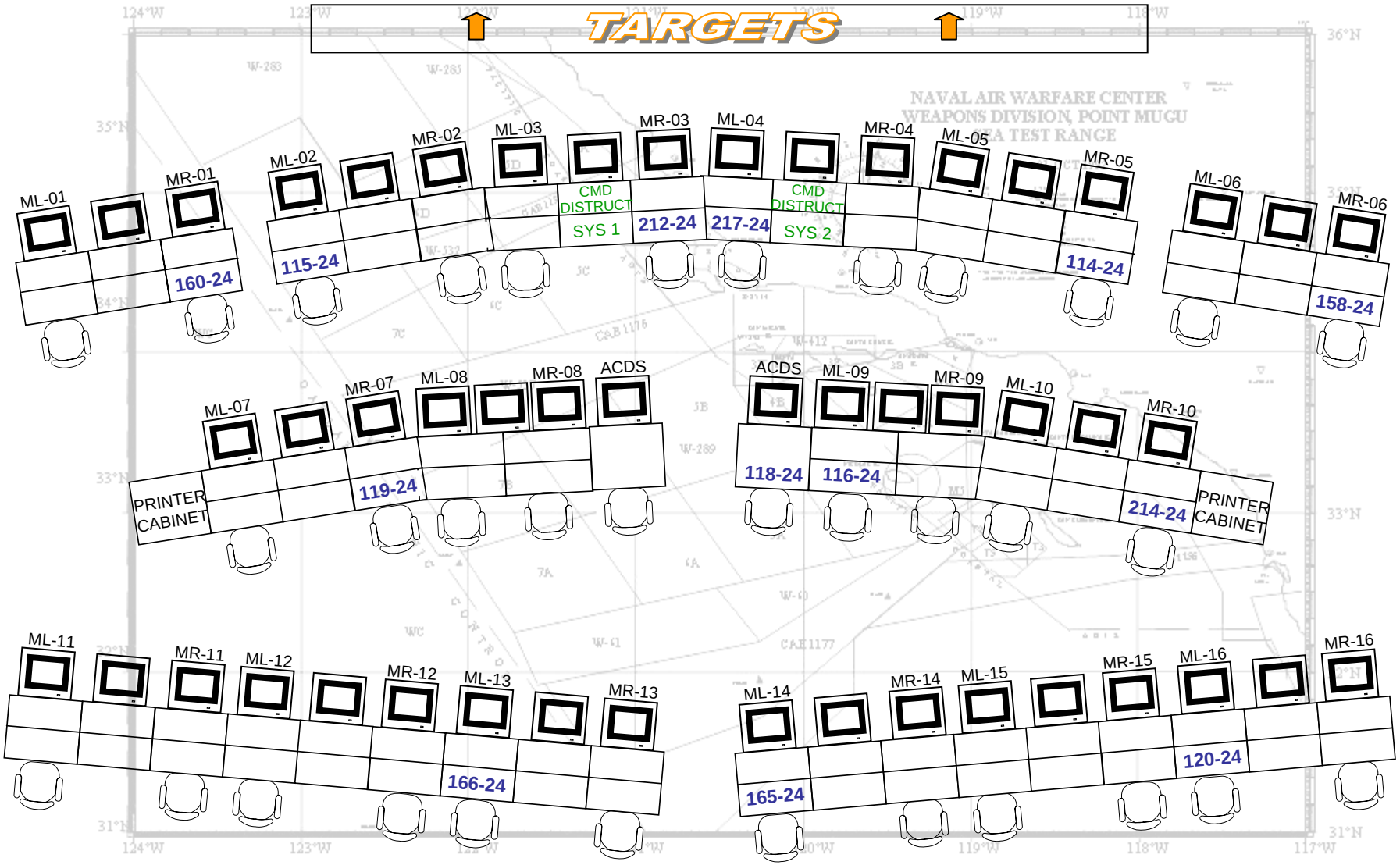
San Nicolas Island

Radar 66

Radar	Location	Type	Notes
62	**SNI**	***RIR-716*** **(SLEP 4)**	
63	**SNI**	**Legacy AN/FPS-16**	**Doppler Super 16. Planned location for SLEP 5**
64	**SNI**	**Legacy AN/FPS-16**	***No action***
66	**SNI**	***RIR-716*** **(SLEP 1)**	**In hazard footprint of some ops, but good west end LOS.**
67	**SNI**	***RIR-716*** **(SLEP 2)**	
71	**Point Mugu**	***RIR-716*** **(SLEP 3)**	
72	**Point Mugu**	**Legacy AN/FPS-16**	

Operational Control Room –Mike (OCR-M)

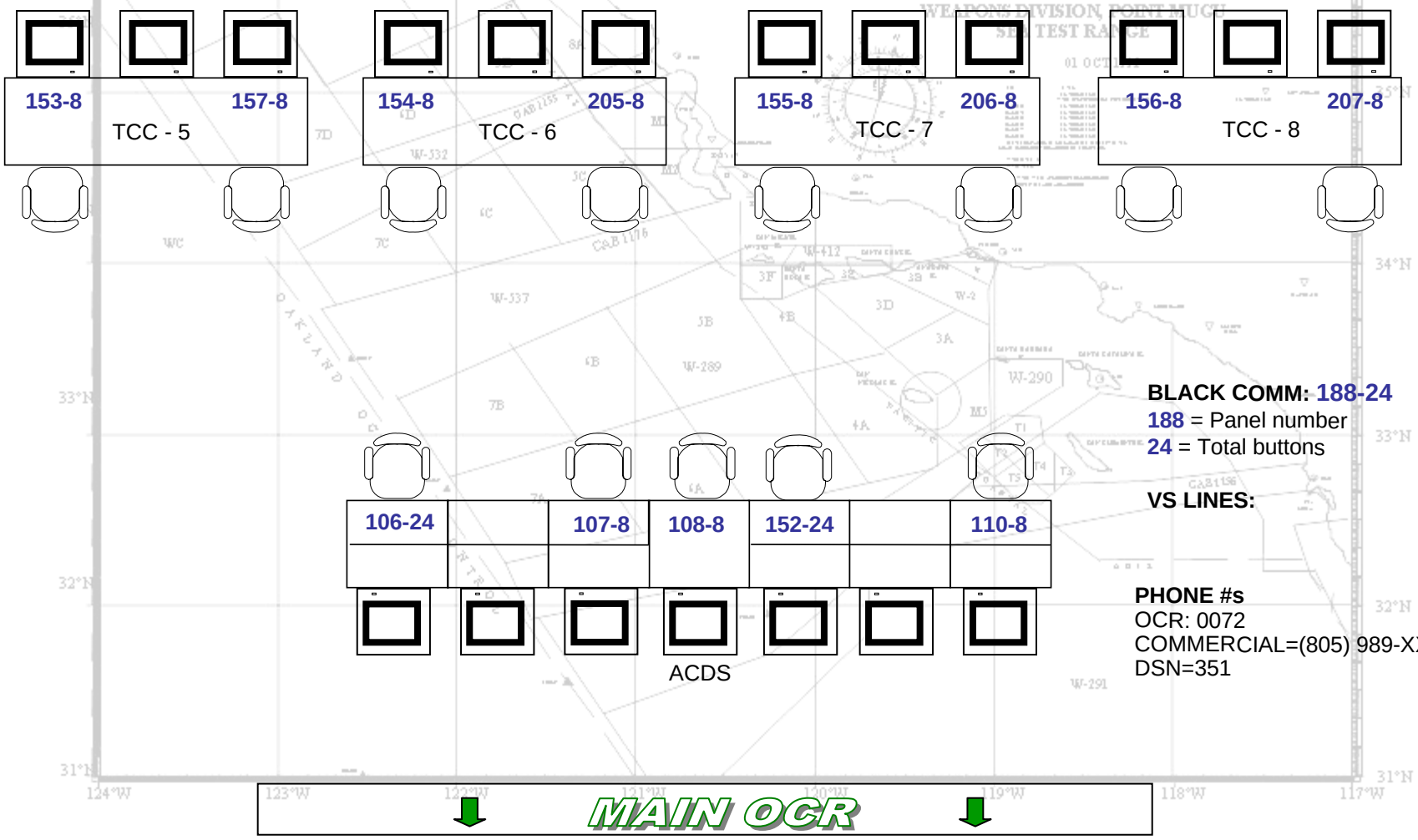
Operational Control Room
"MIKE" Layout



PHONE #
(805)989-0072, DSN 351

BLACK COMM: 188-24
188 = Panel number
24 = Total buttons

Operational Control Room
"MIKE" TARGETS Layout



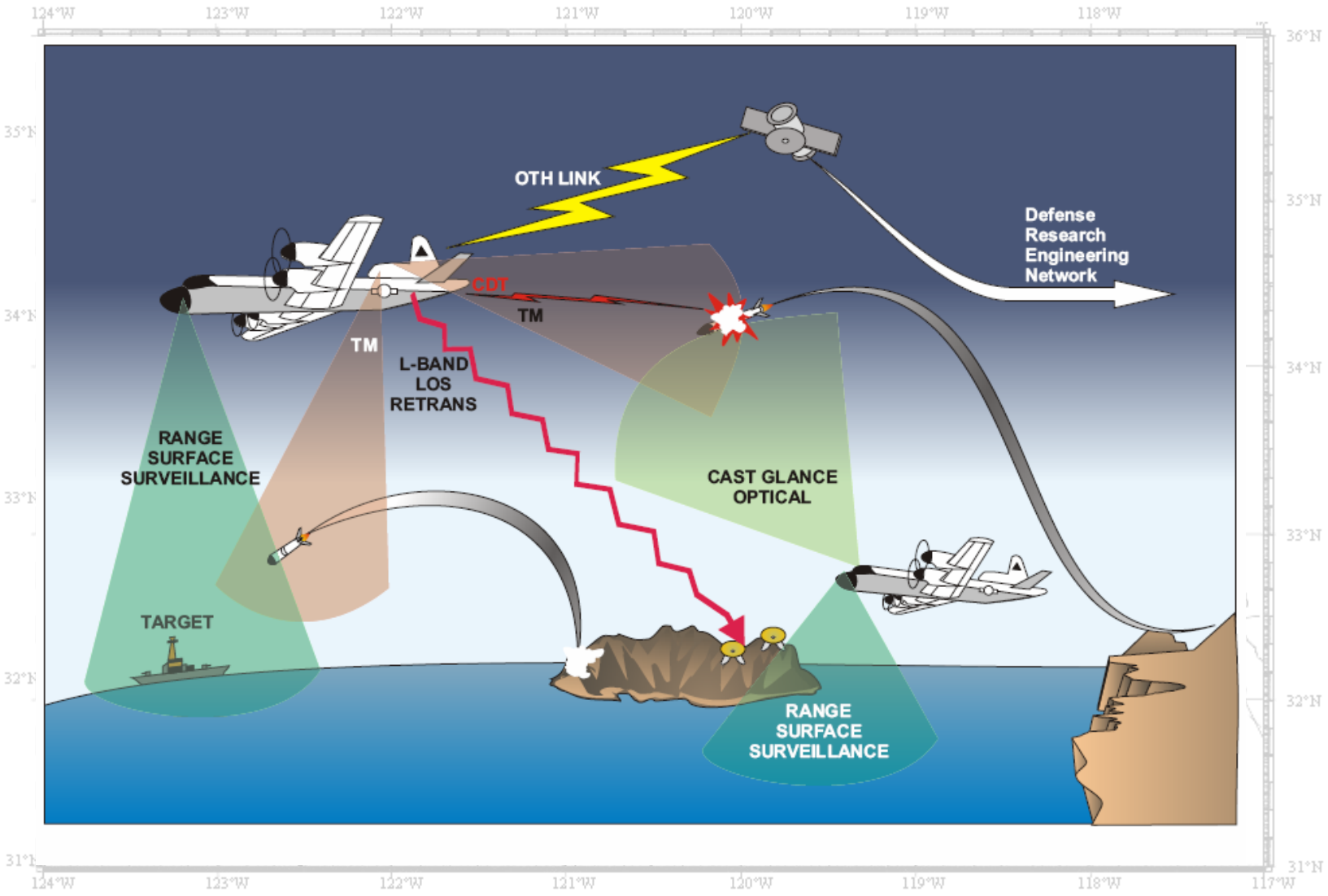
BLACK COMM: 188-24
188 = Panel number
24 = Total buttons

VS LINES:

PHONE #s
OCR: 0072
COMMERCIAL=(805) 989-XXXX
DSN=351


079 20 24 13
2931 -5
14 43 33
079 20 24 13

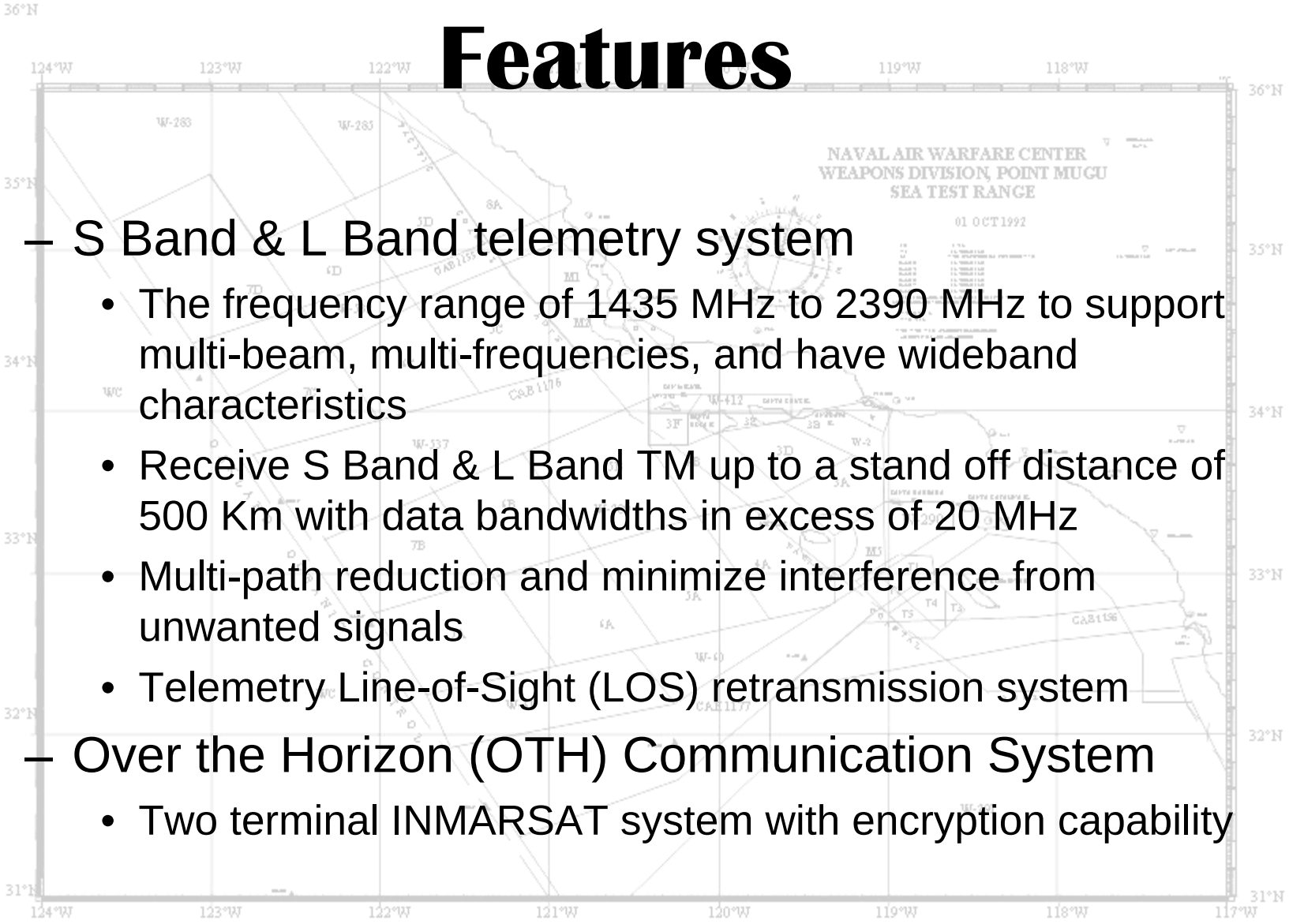
Next Generation Range Support Aircraft



NGRSA Planned Capabilities

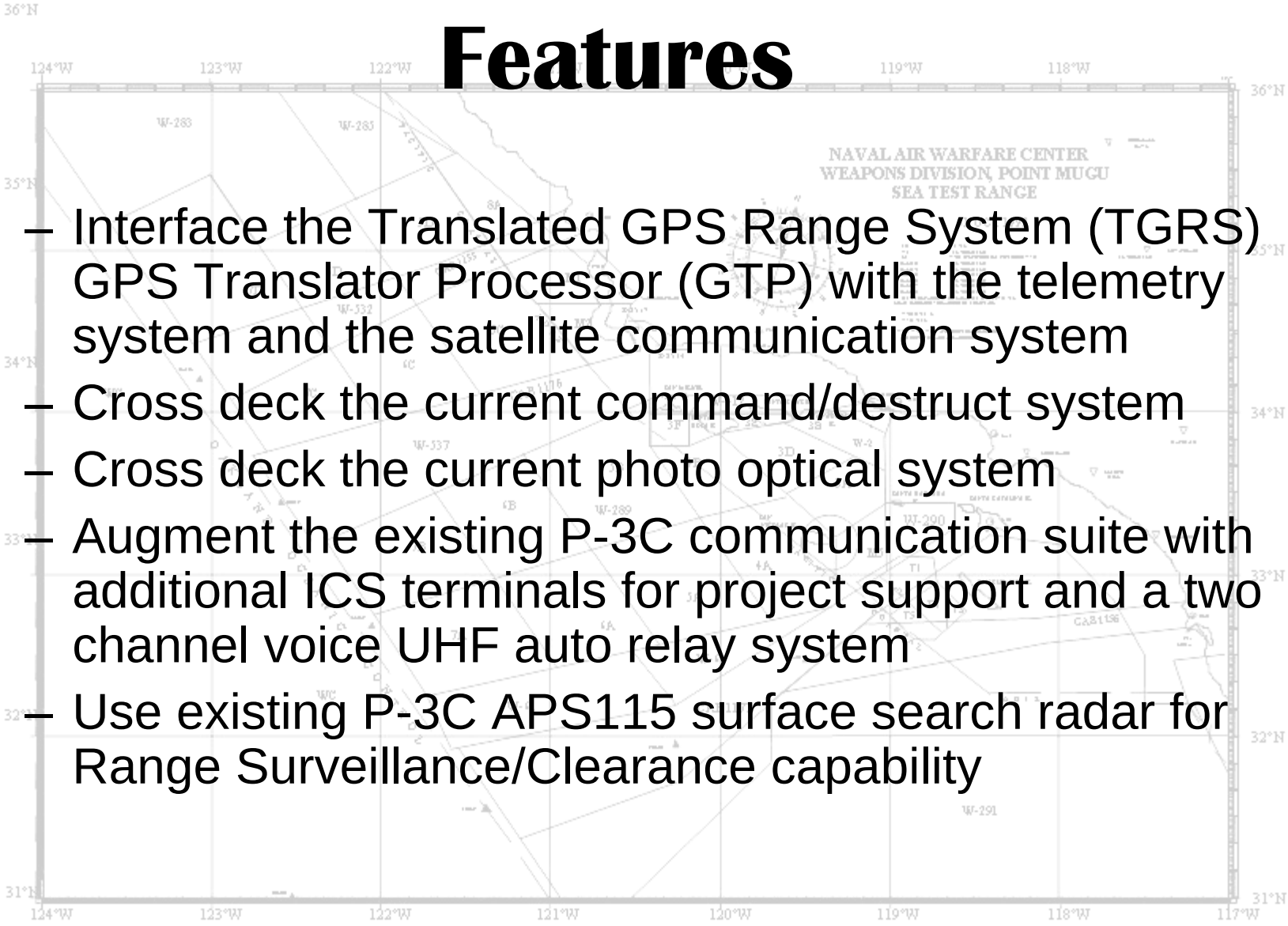
- **Total of three P-3C Aircraft modified to provide an Integrated Airborne Multi-Frequency, Multi-Beam, Wideband Airborne Telemetry System**
  - Further extension of existing instrumented ranges with telemetry retransmission.
  - Capability to operate as an autonomous self contained command center
  - Capability to re-transmit near real-time operational status of test vehicle to program headquarters.

Features



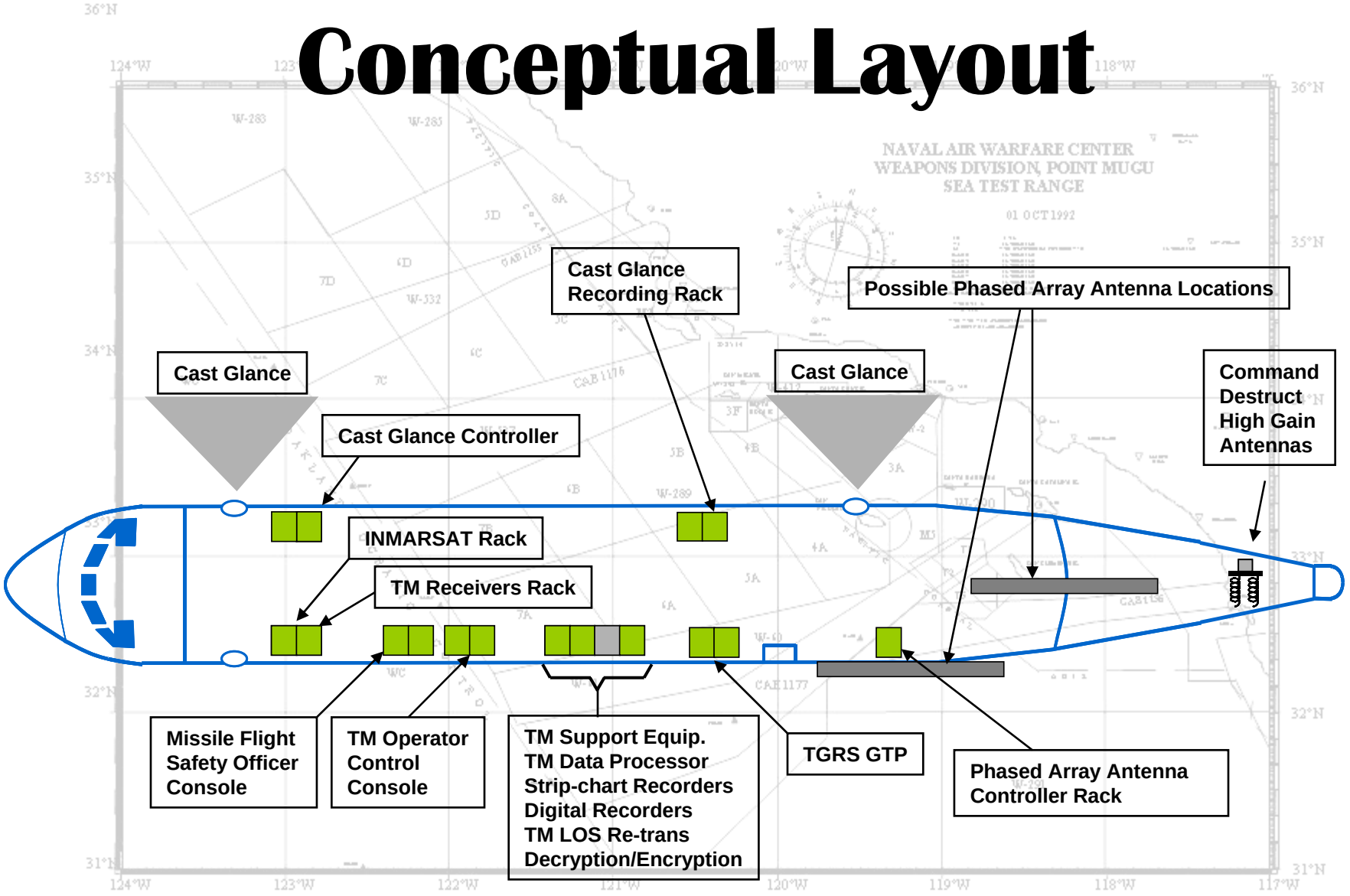
- S Band & L Band telemetry system
  - The frequency range of 1435 MHz to 2390 MHz to support multi-beam, multi-frequencies, and have wideband characteristics
  - Receive S Band & L Band TM up to a stand off distance of 500 Km with data bandwidths in excess of 20 MHz
  - Multi-path reduction and minimize interference from unwanted signals
  - Telemetry Line-of-Sight (LOS) retransmission system
- Over the Horizon (OTH) Communication System
  - Two terminal INMARSAT system with encryption capability

Features



- Interface the Translated GPS Range System (TGRS) GPS Translator Processor (GTP) with the telemetry system and the satellite communication system
- Cross deck the current command/destruct system
- Cross deck the current photo optical system
- Augment the existing P-3C communication suite with additional ICS terminals for project support and a two channel voice UHF auto relay system
- Use existing P-3C APS115 surface search radar for Range Surveillance/Clearance capability

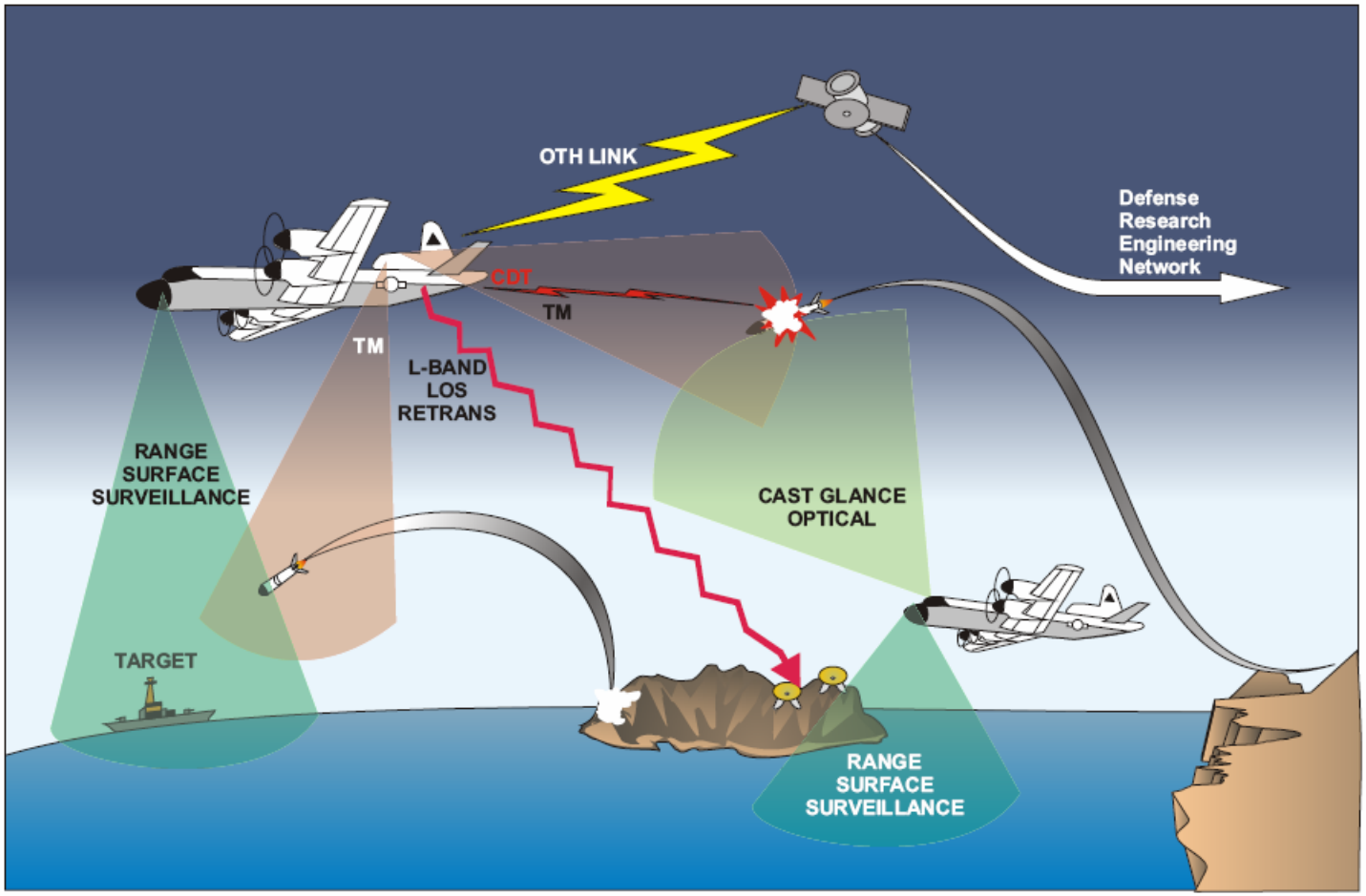
Conceptual Layout



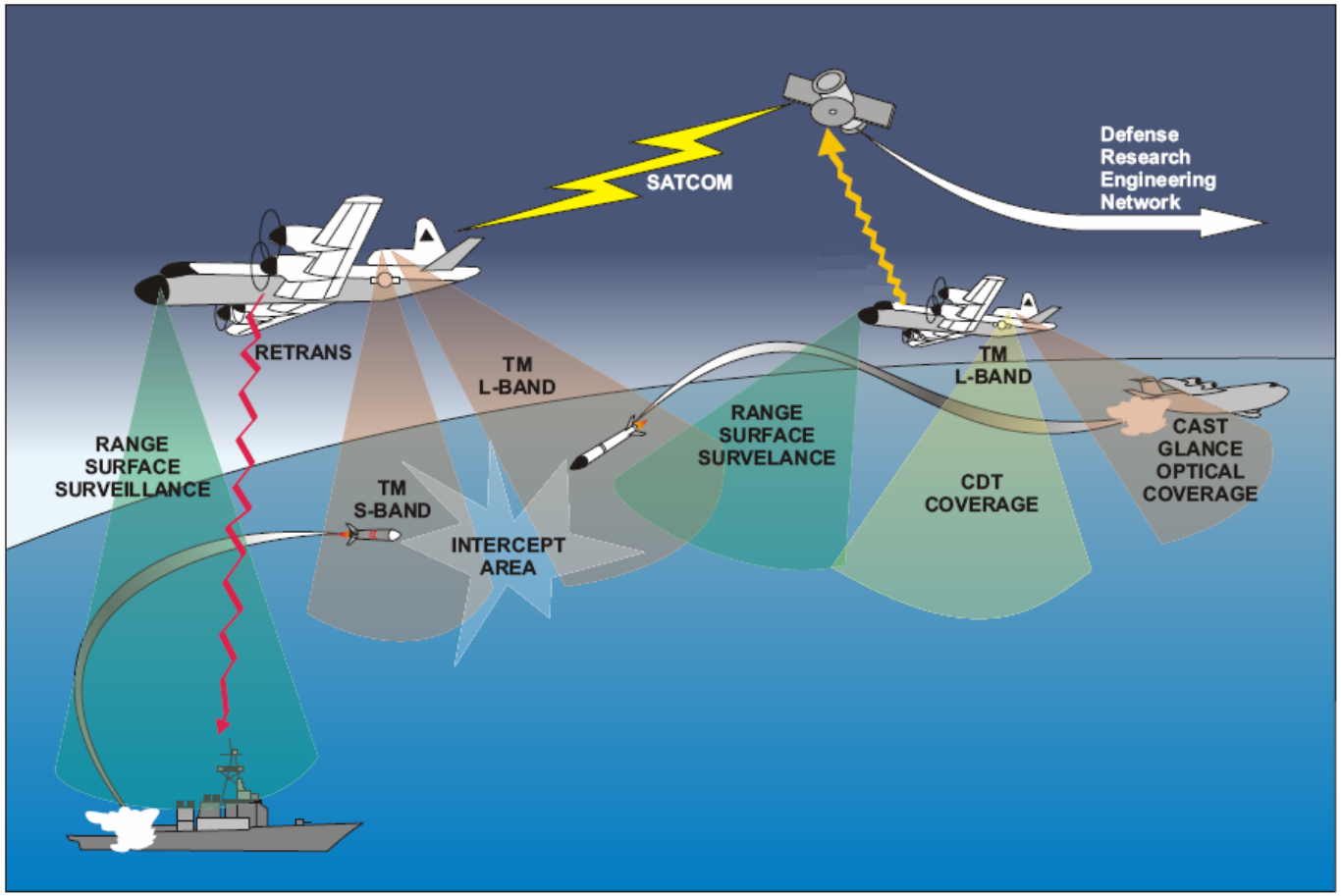
Benefits and Payoffs

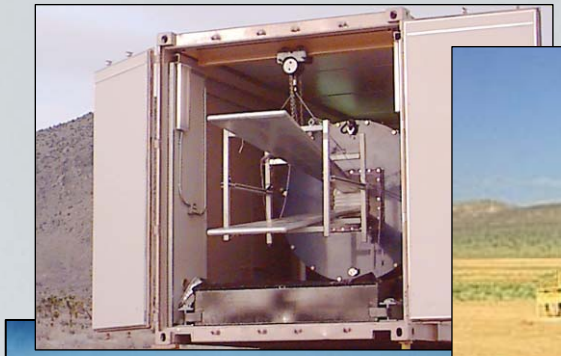
- **Mobile T&E Asset**
  - **MRTFB Ranges**
    - **Extends the instrumented ranges**
  - **Open Ocean Testing**
- **Self Contained Command Center**

Integrated T&E Solution
Extended Range Testing Scenario



Integrated T&E Solution
Open Ocean Testing Scenario

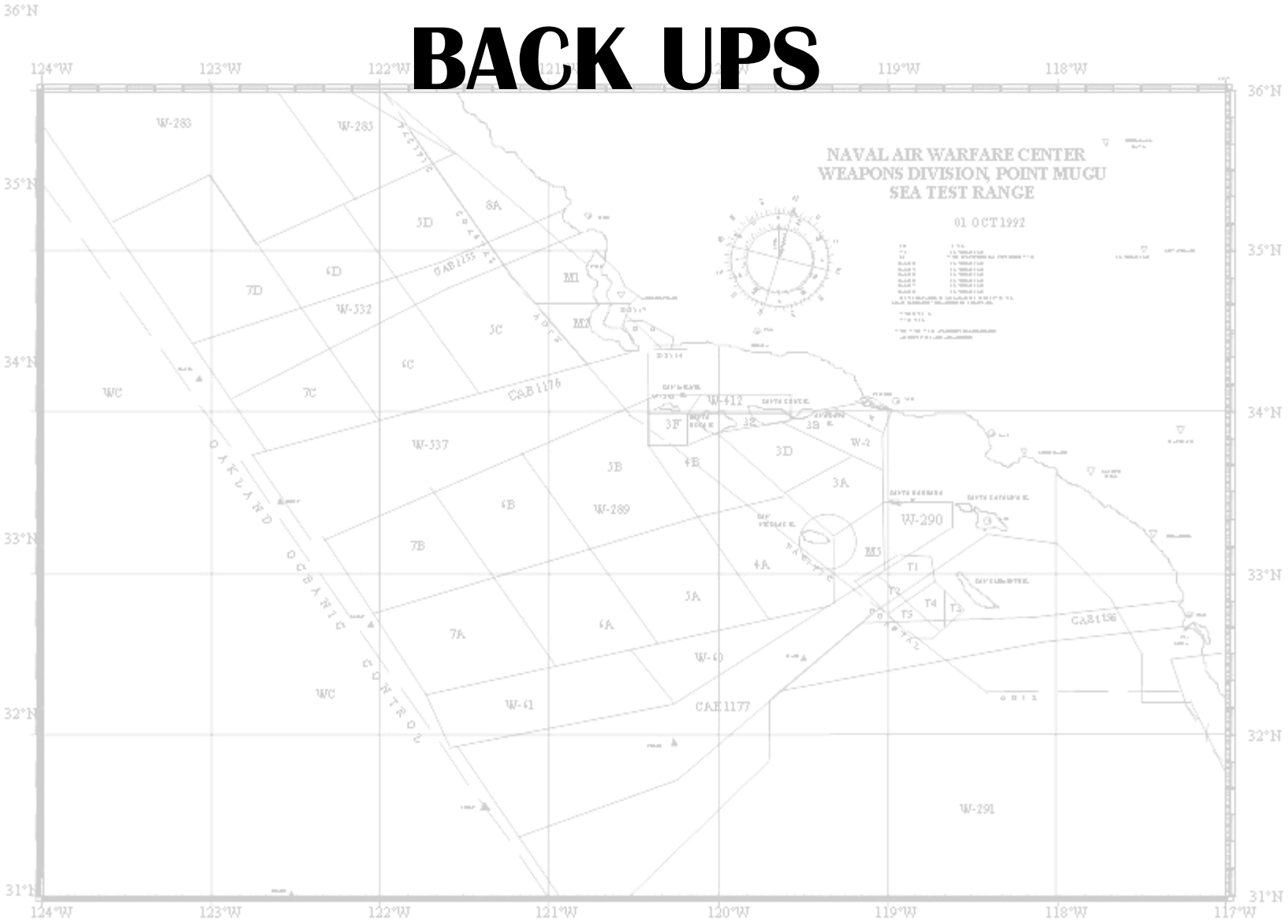




NAVAIR

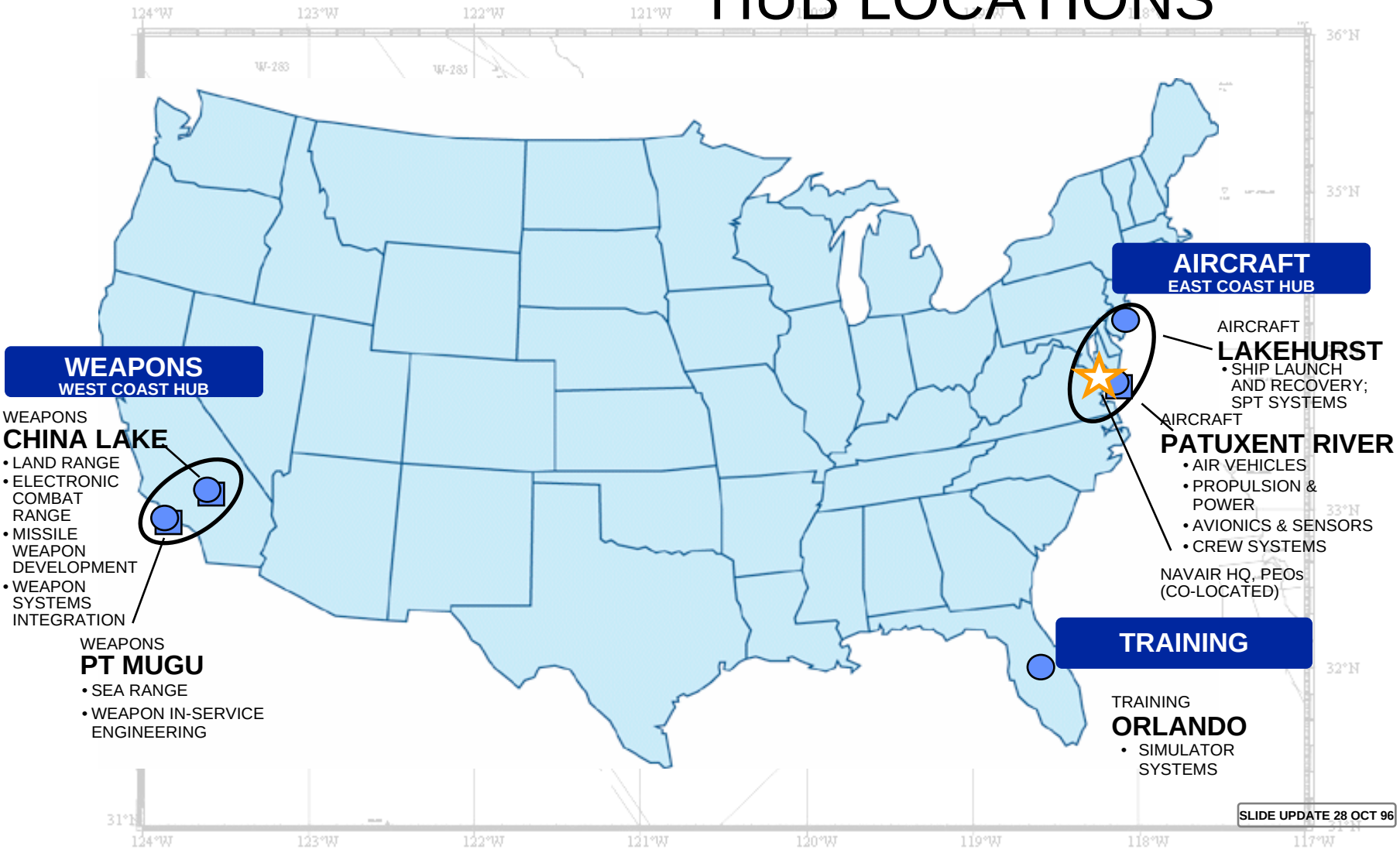
Ranges

BACK UPS



NAVAIR

PRODUCT CENTER HUB LOCATIONS



WEAPONS
WEST COAST HUB

WEAPONS
CHINA LAKE
- LAND RANGE
- ELECTRONIC COMBAT RANGE
- MISSILE WEAPON DEVELOPMENT
- WEAPON SYSTEMS INTEGRATION

WEAPONS
PT MUGU
- SEA RANGE
- WEAPON IN-SERVICE ENGINEERING

AIRCRAFT
EAST COAST HUB

AIRCRAFT
LAKEHURST
- SHIP LAUNCH AND RECOVERY; SPT SYSTEMS

AIRCRAFT
PATUXENT RIVER
- AIR VEHICLES
- PROPULSION & POWER
- AVIONICS & SENSORS
- CREW SYSTEMS

NAVAIR HQ, PEOs (CO-LOCATED)

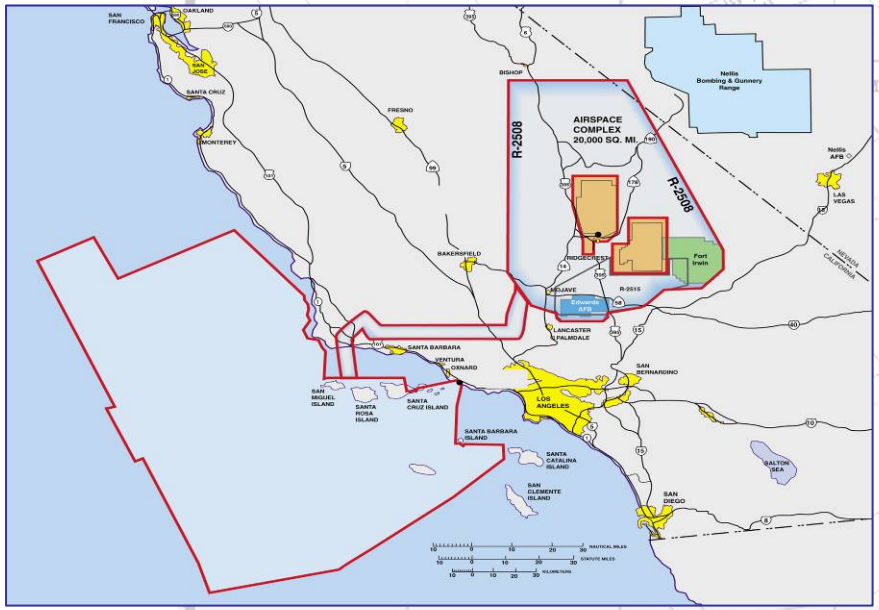
TRAINING

TRAINING
ORLANDO
- SIMULATOR SYSTEMS

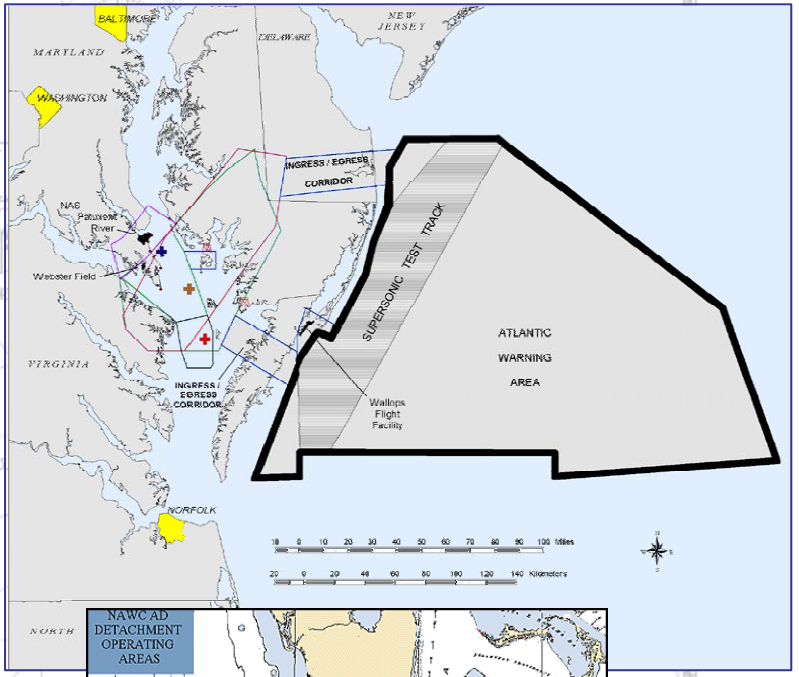
SLIDE UPDATE 28 OCT 96

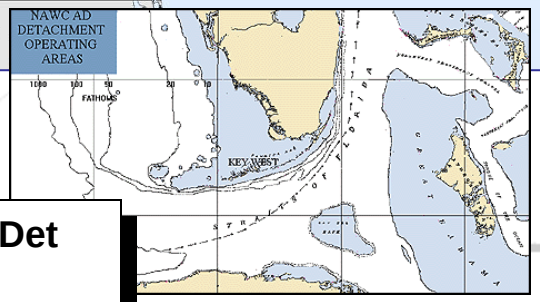
Ranges

Pacific Ranges



Atlantic Ranges





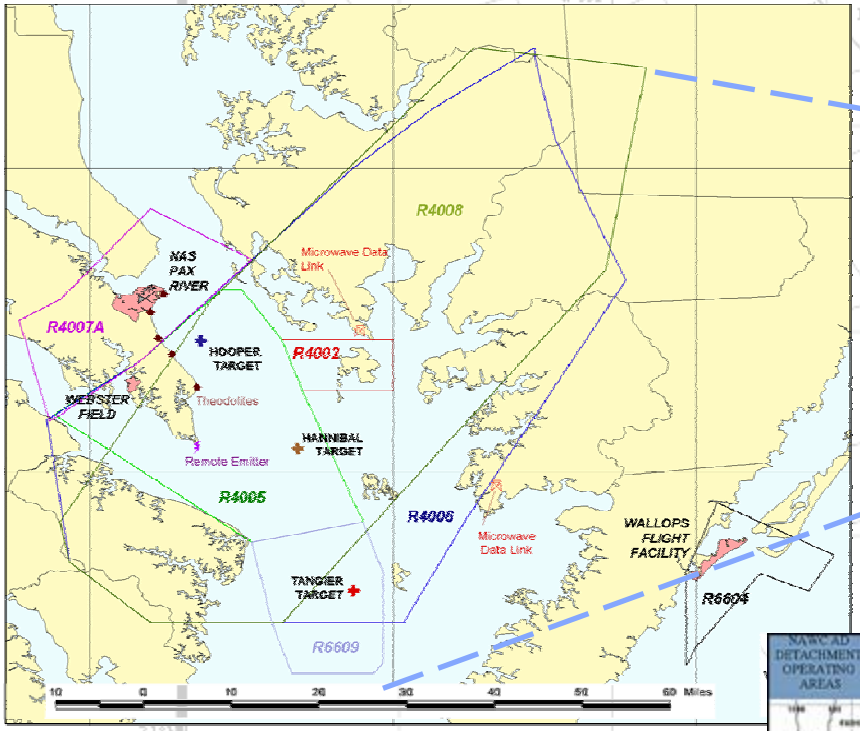
NAWCAD Key West Det
Surface and SUA

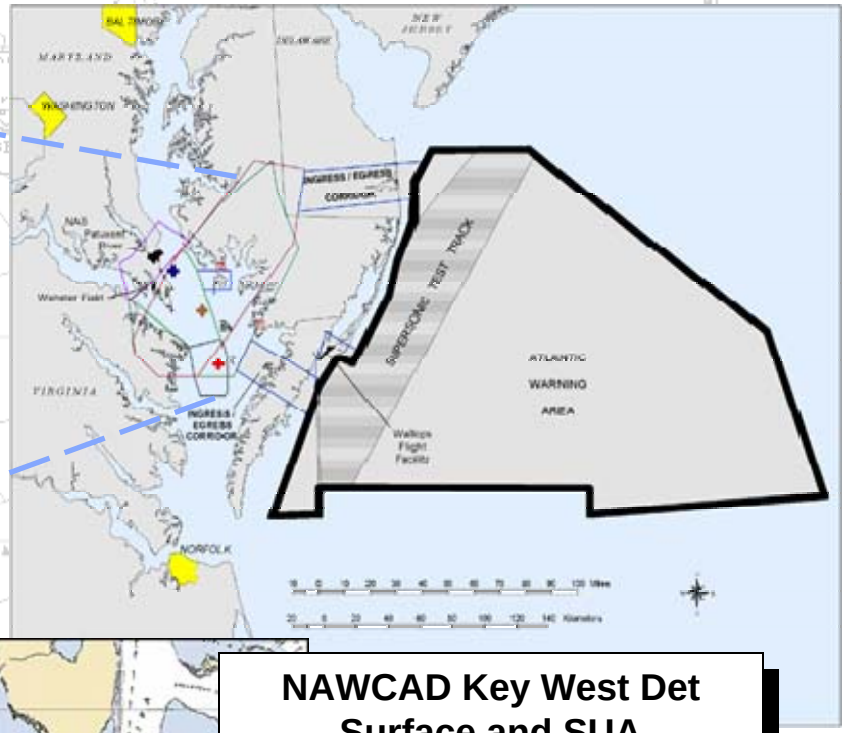

Atlantic Test Ranges
Cedar Point Complex

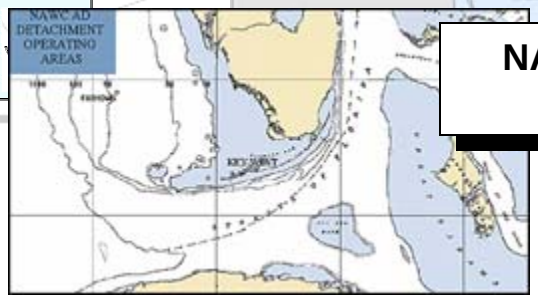
Patuxent River Special Use Restricted Airspace

Chesapeake Test Range
Restricted Areas R-4002/5/6/7/8
Approximately 2,400 square miles
Surface to 85,000 feet

Offshore Ranges
Warning Areas W-107/8/386
Approximately 18,000 square miles
Surface to unlimited altitude







NAWCAD Key West Det
Surface and SUA

NASA WALLOPS FLIGHT FACILITY (WFF)

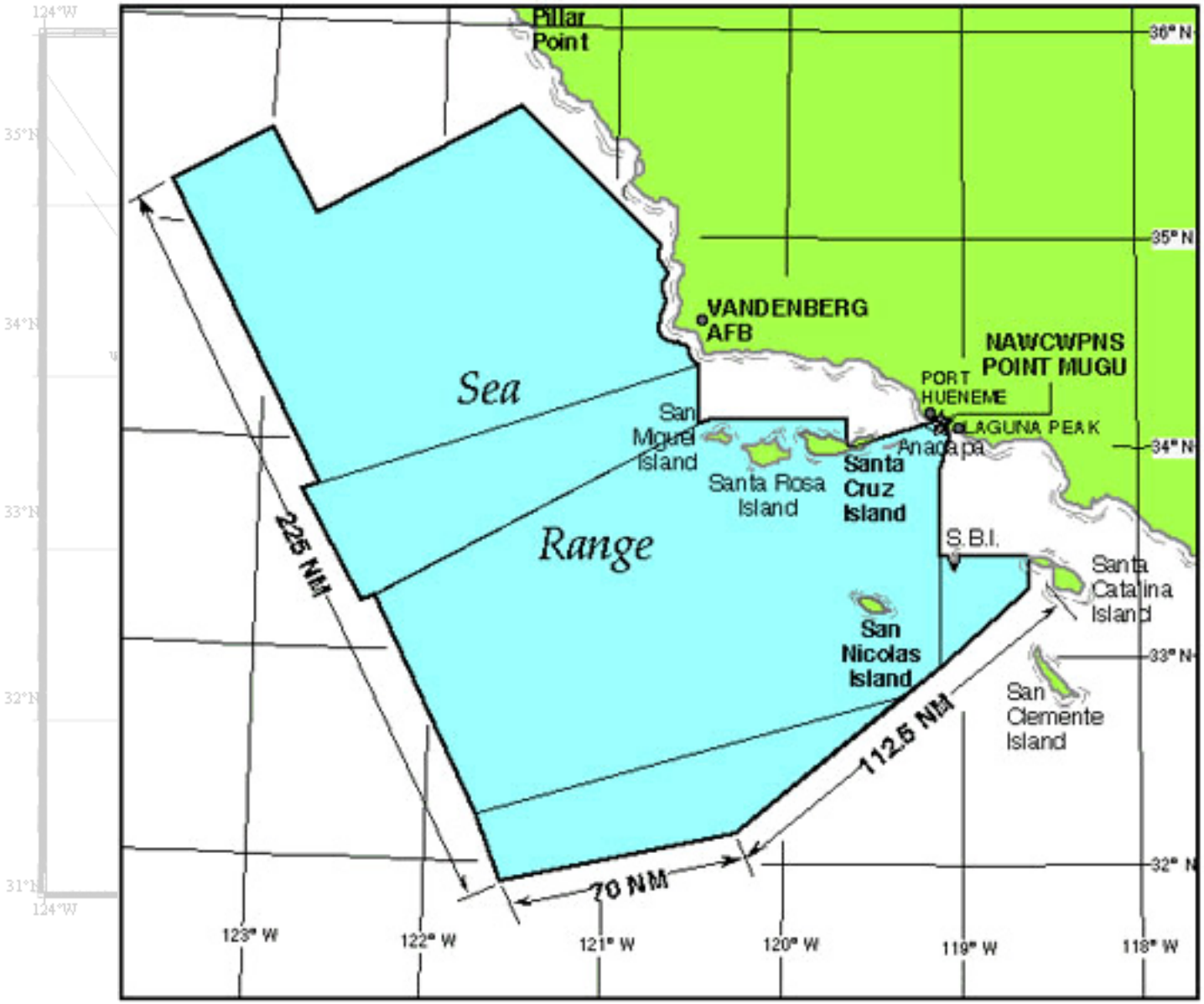
WFF Main Base

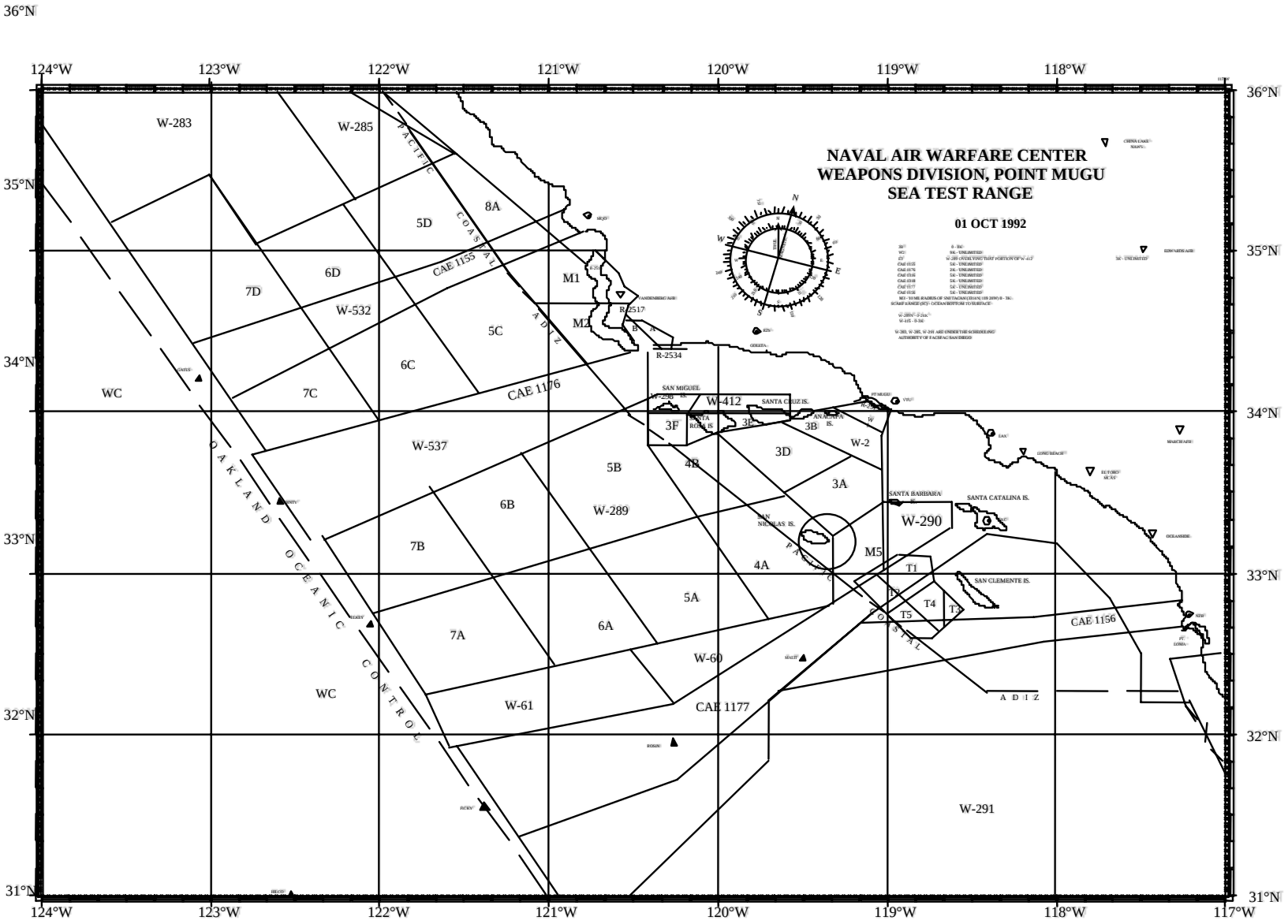
3 Runways

- ***04/22: 8750' x 150'***
- ***10/28: 8000' x 200'***
- ***17/35: 4820' x 150'***

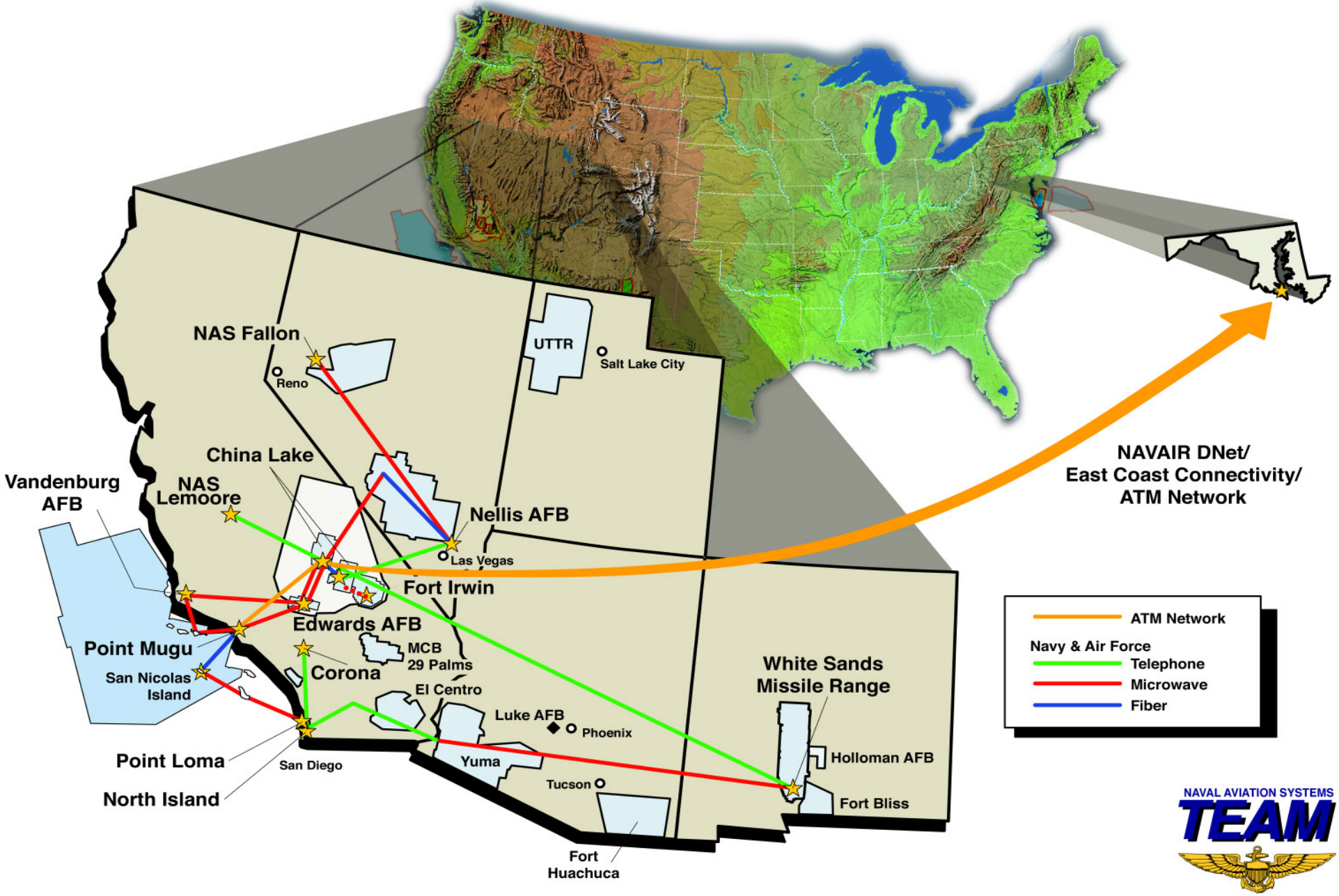
Wallops Island

Airspace





Western Test &Training Range Connectivity



Range Timing & Data Infrastructure Reengineering (RTDIR)

POC: Richard Stahle
Phone: (805) 989-5107
FAX: (805) 989-7808
E-mail: Richard.Stahle@navy.mil

Executing Activity: NAWCWD
Fielding Location: ECR, LR, SR

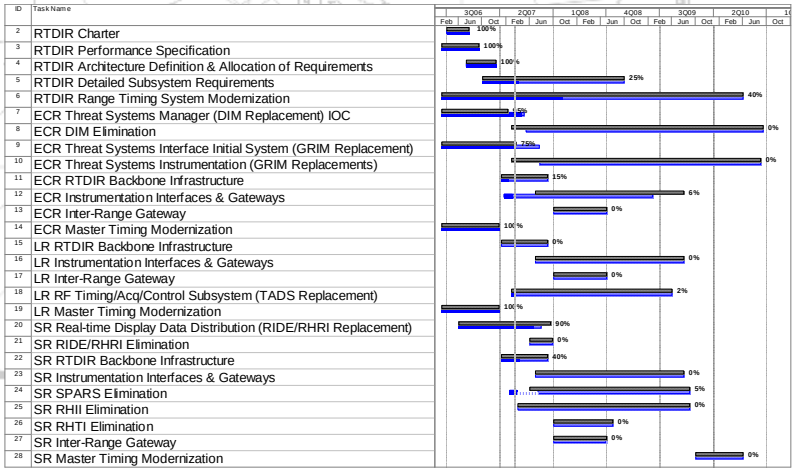
PROJECT DESCRIPTION/JUSTIFICATION

The Range Timing & Data Infrastructure Reengineering project provides the NAVAIR Land Range (LR), Sea Range (SR), and Electronic Combat Range (ECR) with a common architecture and hardware/software solution for the integration of range timing & sensor systems into the range processing and display systems and the intercommunication of range systems among the NAVAIR ranges. Currently each of these ranges employs a range-unique solution. The use of low-cost commercial hardware and the re-use of software components among the ranges will minimize subsequent M&O costs. Integration of new range sensor systems will be facilitated by this common approach as range interfaces only have to be developed once to support the NAVAIR ECR/LR/SR ranges. In addition, this project will provide a unified approach for the integration of FI2010 TENA capability into the NAVAIR Land, Sea, and Electronic Combat Ranges.

TEST ITEMS SUPPORTED

AEGIS (2)	CSSQT 2008	EA-18G	OT 2008-2009
CVN (3)	CSSQT 2008	F/A-18 21X/23X OFP	2008-2009
Tomahawk	DT/OT 2008-2009	JSF BLK3 IFT/OTII-D	2008-2009
Trident (17)	OT 2008-2014	AARGM	DT/OT 2008
Minuteman (6)	2008	MQ-9 Predator-B UAS	2008
EA-18G	DT/OT 2008-2009		
Strike DIRCM	DT/OT 2009-2011		
Assault DIRCM	DT/OT 2011-2012		

Funding Profile	FY06	FY07	FY08	FY09	FY10	Total $ Programmed
Needs & Solutions Estimate	600	2550	2290	1500	0	6940
Original I&M Funding	600	2550	2290	1500	0	6940
I&M Funding	583	1870	1255	2415	735	6858
Total	583	1870	1255	2415	735	6858
Additional I&M funds Req	0	0	0			0

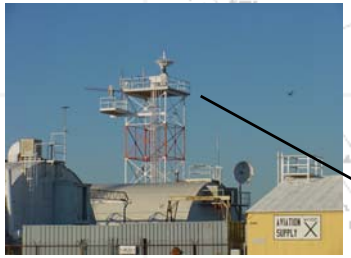


LR Current Capabilities

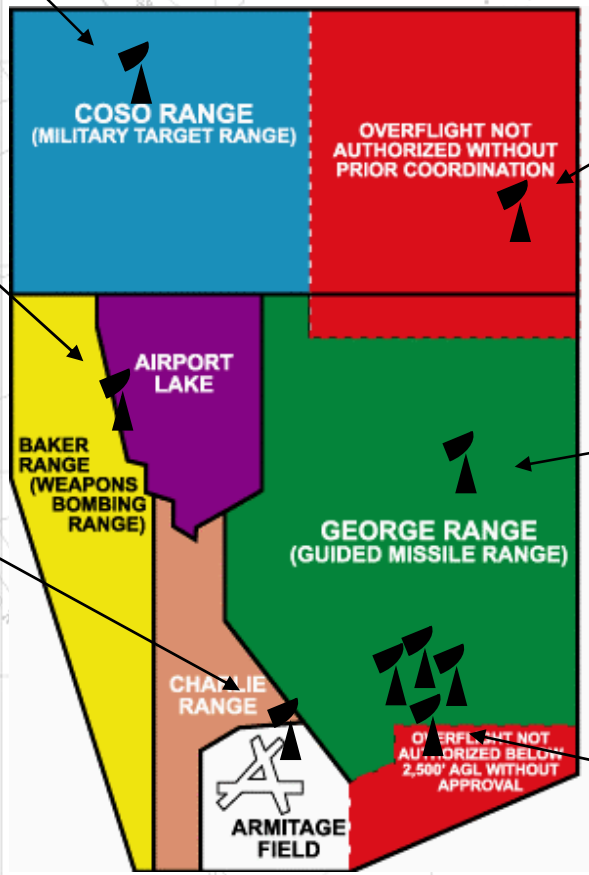
Mobile #1
-8’ System
-Remote locations
-Self-contained

Cinder Mtn
-8’ System
-Airport Lake
-Baker Range
-Charlie Range
-George Range

Shrike Tower
-6’ System
-Airfield area
-2 Spirals for ground checks



Laurel Mtn
-6’ System
-16’ System
-North Range
-ECR
-Edwards AFB



Parrot Peak
-16’ System
-Coso Range
-Panamint Valley
-Searles Valley
-ECR

J-62
-8’ System
-Baker Range
-Airport Lake
-Charlie Range
-George Range

T-Pad
-Four 6’ Systems
-Baker Range
-Charlie Range
-George Range

Project Description

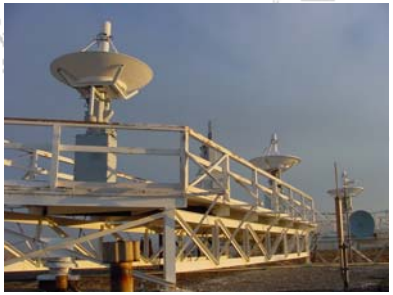
Land Range

Mobile System

• Replacing ACU and receivers.

• Procuring new antenna system.

• Procured two new antenna systems.



• Procuring two new antenna systems.

Robotic Systems
Joint Project Office

NDIA Briefing

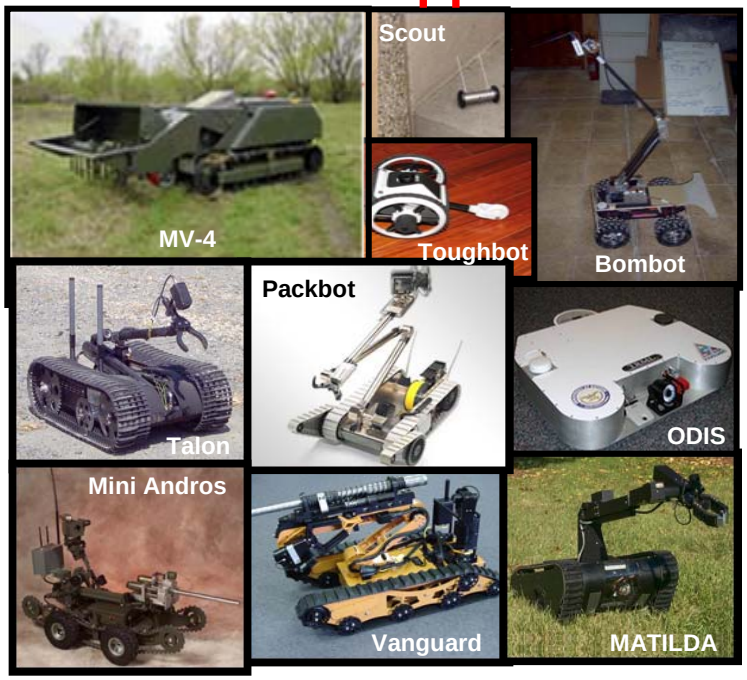
30 October, 2007

Our Mission

Adapting to the Changing World

Mission

Robots Supported



Over 5,000 Robots OIF/OEF in 2007

The World Changed…

Evolution of Ground Robotics in War

2003 22 Systems
- Afghanistan
- 12 Packbots / 6 MATILDAs
- 4 Mini Flails
- No Support

2004 162 Systems
- No Single Vendor Could Produce 162
- 5 Vendors, Multiple Configurations
- Joint Effort, EOD Focused
- Joint Robotic Repair Facility Evolution

2005 1800 Systems
- Robots' Proven Ability to Save Lives
- Expansion Beyond EOD Mission (Countermine, Security)
- Recognition of Need for "Single Bellybutton"
- MOAs with AMC and REF

2006 4000 Systems
- Engineers & Infantry
- Route Clearance, Explosive Detection & Weaponization Development.
- Pre-Deployment Training and Joint Robot Repair Teams (JRRTs)
- Supply Chain Management of COTS

2007 5000 Systems
- Special Forces Robot Applications Assessed
- Route Clearance, Explosive Detection & Weaponization on Battlefield
- Pre-Deployment & JRRT Expansion Based on Increased Requirement
- Supply Chain Management Refined and Picked Up By Numerous Outside Programs

What Robots Can Do

Accomplish the Mission...

...and Reduce Attrition

2006 Measures of Effectiveness (OIF)

# of Missions	# of Found & Cleared IEDs	# of Destroyed Robots
30,000	11,100	150

- 16,000 Robot Repairs Conducted Annually
- Find and Clear Rate is Approximately 37%
- SOP is to Employ a Ground Robot first
- Bomb Suits Only used When Terrain Prevents Robot Employment

Ground Robots Out of Action

Joint Robotic Repair Facility (OIF)

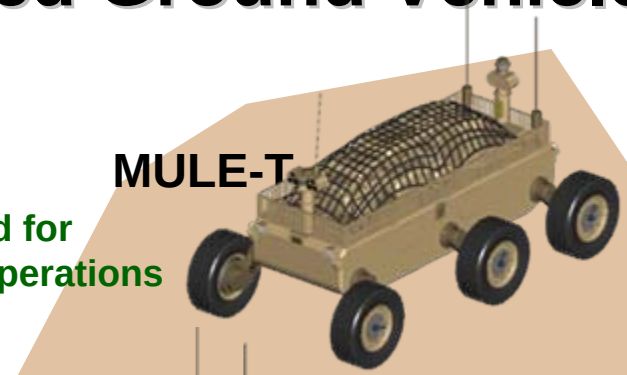
OIF Ground Systems

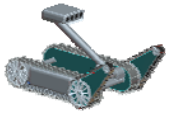
Gladiator

Future Combat Systems
Unmanned Ground Vehicles

MULE-T

Optimized for
Dismounted Operations





SUGV
Manpackable

Mobility in
areas that are
too small for
soldiers

ARV-A(L)

MULE-CM

UH-60 Helicopter
Transportable
Provide same mobility as soldier

Optimized for
Mounted Operations

ARV-RSTA
Deferred

ARV-Assault
Deferred

C-130 Transportable
Provide same mobility as
Manned Ground Vehicle (MGV)

Challenges Ahead

- CONOPS Beyond FCS
- Technology
  - EMI Environment
  - Processor Speed
  - Depth Perception
  - Autonomy Decision Algorithm

NAVAIR 5.3
Threat and Target Systems Department
Engineering & Operations Now and into the Future

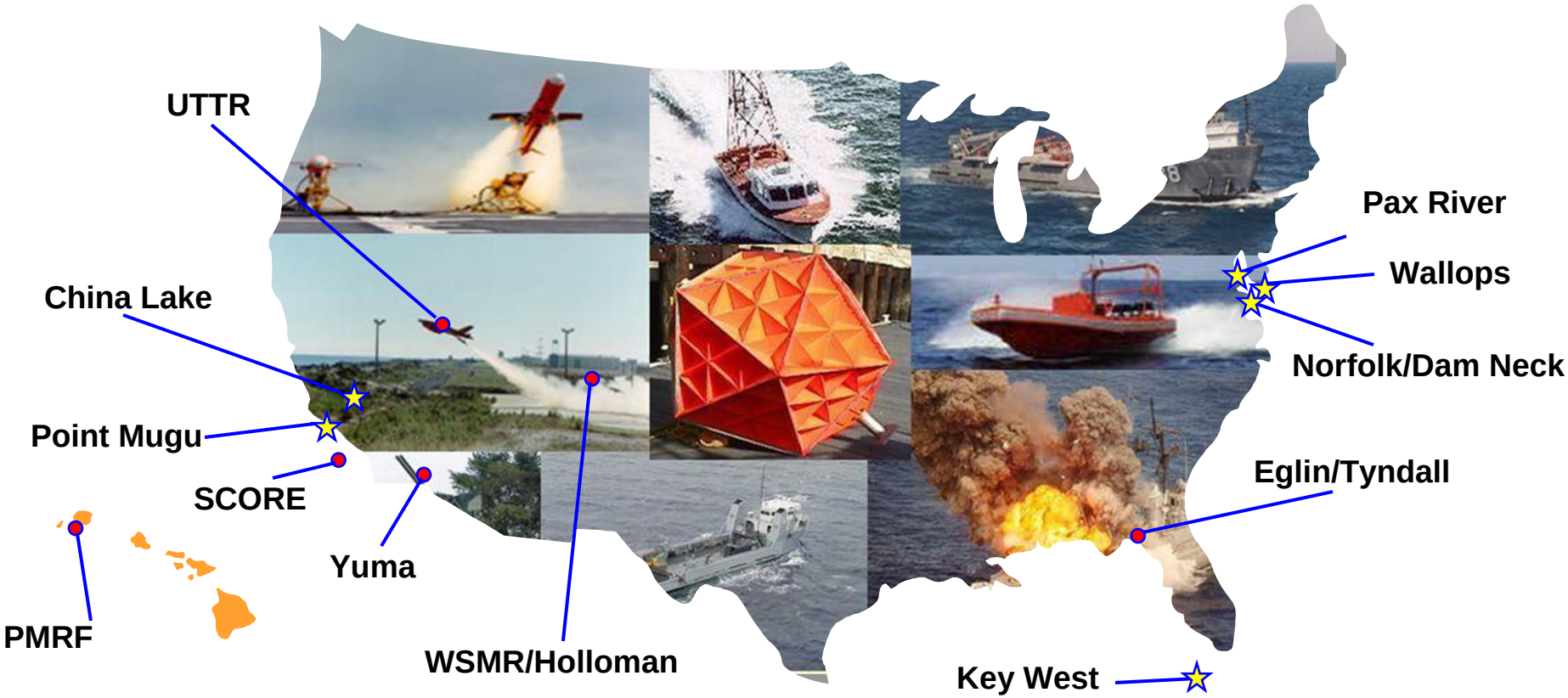
Presented to the NDIA 45th Annual Targets, UAVs & Range Operations Symposium

Thomas Dowd
Director, Threat/Targets Systems Department, AIR 5.3
Naval Air Warfare Center Weapons Division
Point Mugu, CA

OUR MISSION IS TO EMULATE THREATS FOR WEAPONS AND EW SYSTEMS, TEST AND EVALUATION AND TO SUPPORT EXPERIMENTATION AND FLEET TRAINING

UNDERSTANDING THE CRITICAL MASS
Generic/Surrogate/Validated/Replica/Actual
(Cost Effective Fidelity for T&E)

TTSD Operating Sites

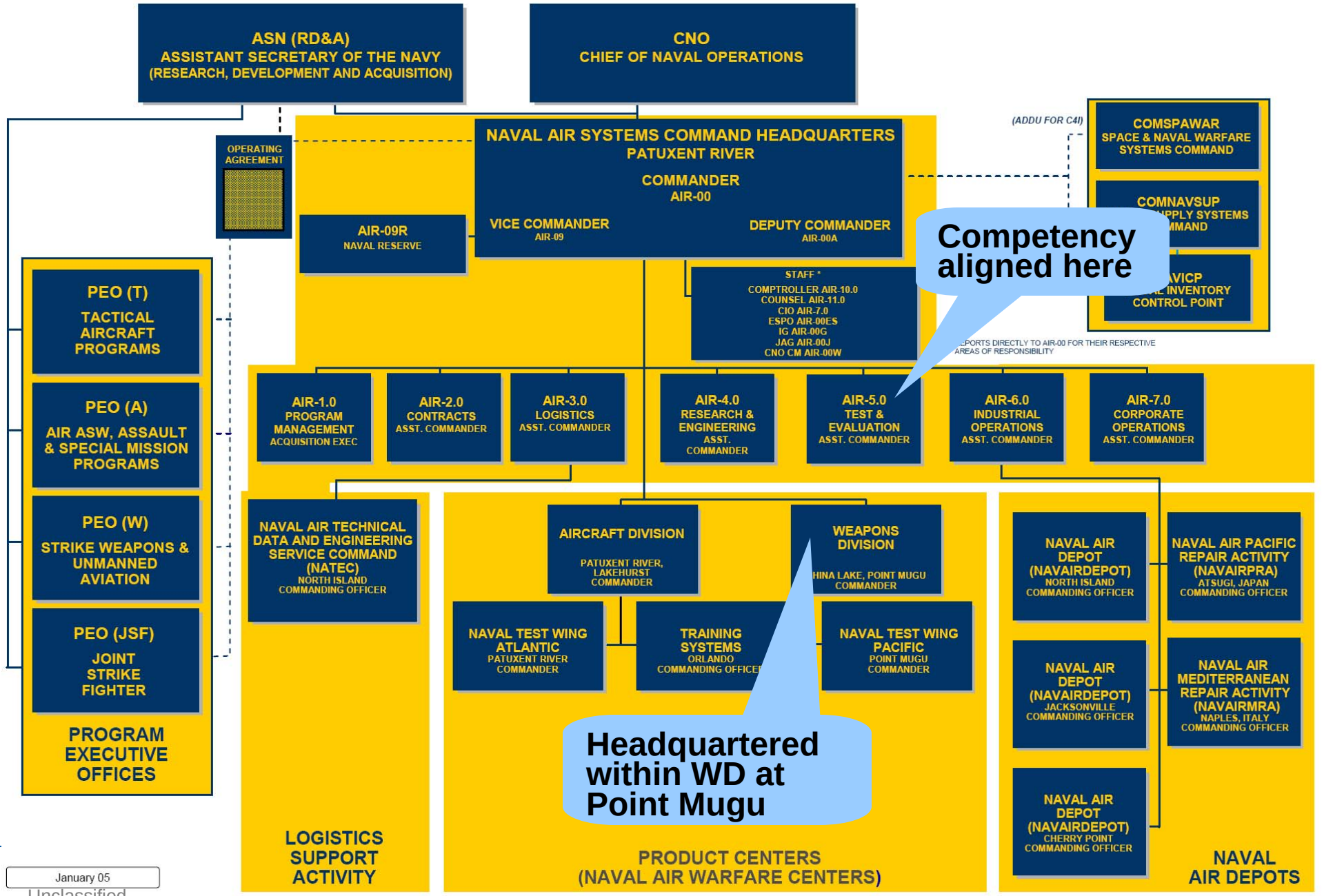


☆ Department Operating Activities

● Sites TTSD Deploys To Regularly

NAVAIR

REPORTING RELATIONSHIPS



5.0 TEST & EVALUATION

RDML Dunaway
AIR-5.0
Assistant Commander
(760) 939-2201

Mr. Greer
AIR-5.0A
Deputy Assistant Commander
(301) 342-1129

5.0C
Staff Office
Mr. Vargo
(301) 342-4090

5.0D
ACC Office
CDR Teichert
(301) 757-8267

Asst CDR for T&E

5.0F
Aviation Safety Office
CDR Stiffel
(301) 757-2242

COMNAVAIRSYSCOM

5.0G
AEDC Ops Liaison Office
Mr. Rutland
(931) 454-6675

5. 1 Commanders	
LANT	PAC
Col Mortensen (301) 342-1113	CAPT Hnarakis (805) 989-8763

5.1 Integrated Systems Evaluation, Experimentation & Test
Director
Mr. Cricchi (301) 342-6758

5.2 Ranges
Director
Mr. Mendonca (805) 989-7275

5.3 Threat/Target Systems
Director
Mr. Dowd (805) 989-8534

5.4 Integrated Battlespace Simulation & Test
Director
Mr. Young (301) 342-6008

5.3 Threat & Target Systems Department

Scott Foisy
Associate for Business Operations

Ben Rasnick
Associate for Projects

531 Target Systems Engineering	532 Pacific Target and Marine Operations	533 Atlantic Target and Marine Operations	534 Airborne Threat Simulation	535 Combat Environment Simulation	539 Threat/Target Systems TEAM
 Dae Hong	 Bob Williams	 Robert Graham	 Emery Kujiraoka	 Eddy Witzel	

Workforce

~190 Civilians

~270 O&M Contractor Wyrs

~50 Engineering Services Contractor Wyrs

Jeff Blume

Thomas Williams

Garon Harris

Roger Fulton

- Aerial Targets Team
- Surface Targets Team
- Airborne Threat Simulation Team
- Combat Environment Simulation Team
- Advanced Technology Test Team

Functions

Target Systems Engineering

Target systems technology development, acquisition support, systems integration, operations engineering, EIs, LECs

Atlantic/Pacific Target & Marine Operations

World wide surface and airborne target and marine operational services including unique mods and augmentation

Threat/Target Systems Management

Provides entry point for Sponsors to form integrated project offices, and externally directed project offices

Airborne Threat Simulation

Design development and operational support of electronic attack and radar airborne threat emitter systems

Combat Environment Threat Simulation

Development and technical support of EO/IR/MW/UV/Laser/C4I threat simulator systems

5.3 Operates all Aerial Target Types and Variants

Supersonic

AQM-37C

MA-31

GQM-163A

Subsonic

BQM-34S

BQM-74E

Decoys

TALD

ITALD

Developmental

MSST

BQM-74F

BQM-167XX

ATALD

5.3 Operates all Seaborne Target Types and Variants

Generic Threat. Also Tow Tractor

High-speed terrorist threat

Fast-Attack Craft Target

Ship-deployable for at-sea training

Self-propelled ship simulator

5.3 Designs & Operates Several Land-Based Targets

- **Target Mold Prototype & Manufacture**
  - 3D, 2D, cold air inflatable
  - Copper cladded
  - Trailer mounted
  - Active Emitters Integrated
- **Deliver & Train or Provide Field Operations**
- **Diverse Customers**
  - Primarily Training Purposes
  - Training Ranges
  - JNTC, Army, Navy, Air National Guard









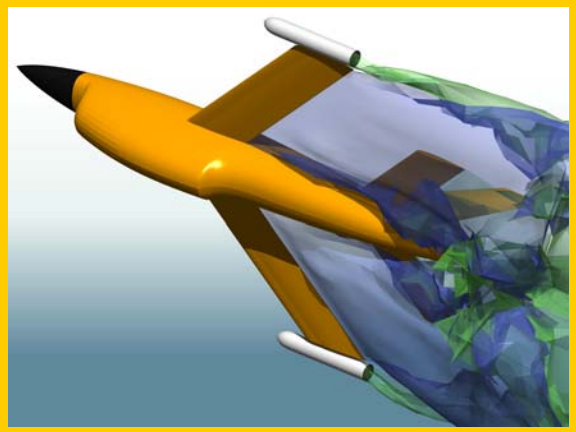
Target Operations

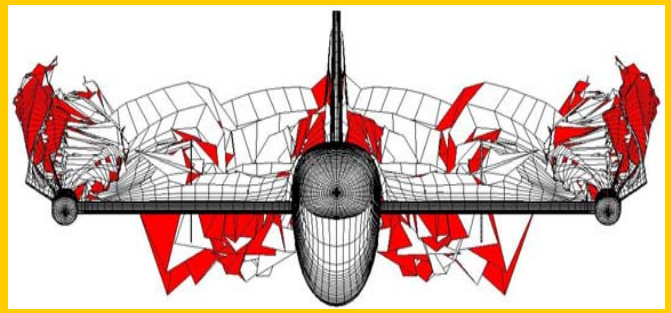
- **East Coast:**
  - 562 surface events (2,700+ mission hours)
- **West Coast**
  - 151 aerial target launches
  - 945 surface events

VC-6 to NAVAIR 5.3 Transition

- **In 2006 CNAF determined to disestablish VC-6; In April 07 USFFC chose NAVAIR 5.3.3 to transition East Coat Fleet Training Target Operations to**
  - First Seaborne detachment stood up Oct 1
  - Two more Seaborne dets and two Aerial dets will phase in by March 08; NAVAIR will be fully responsible by June 08
- **VC-6 FY07 Op Tempo**
  - 57 BQM-74E target launches
  - 936 surface sorties/5,200+ mission hours

5.3 Engineering Highlights





Seaborne Target Efforts

Navy/Reliance Lead for Seaborne Target Development

- **Fast Attack Craft Target**
  - 50 ft length - 50 knots in SS2
  - Missile-capable FIAC threat
  - Development complete
  - Transitioning to production

- **Modular Tow Target**
  - Light weight
  - Replaces Williams Sled & HARM barge
    - **Lower cost**
    - **HSMST towable**
  - Work in progress

BQM-34S(H) Target

BQM-34S Harpoon Target Requirement: Integration of a real world (Harpoon) Anti-Ship Cruise Missile (ASCM) seeker into a BQM-34S target to test Electronic Counter-Measures & decoy systems. The BQM-34S is the only available vehicle that can meet speed and altitude requirements while flying against a manned ship. BQM-34S(H) is a controllable and re-useable Harpoon surrogate that can encrypt, transmit, and record its seeker's video data.

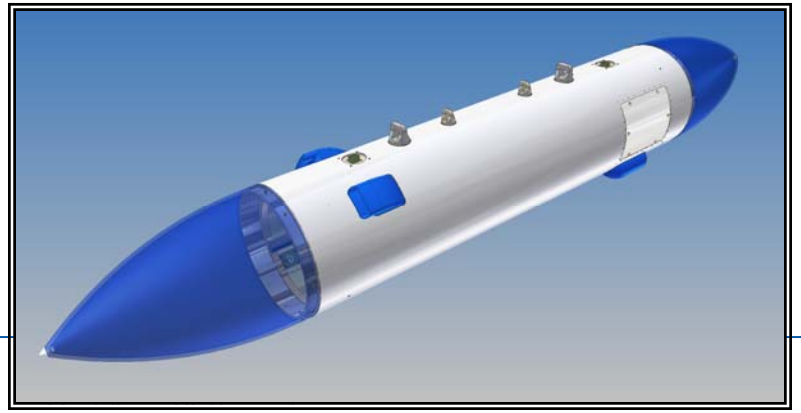
AN/AST-9(V) Simulator

- AN/AST-9(V) is an advanced supersonic airborne radar simulator pod developed for Fleet training and weapon system Test & Evaluation.

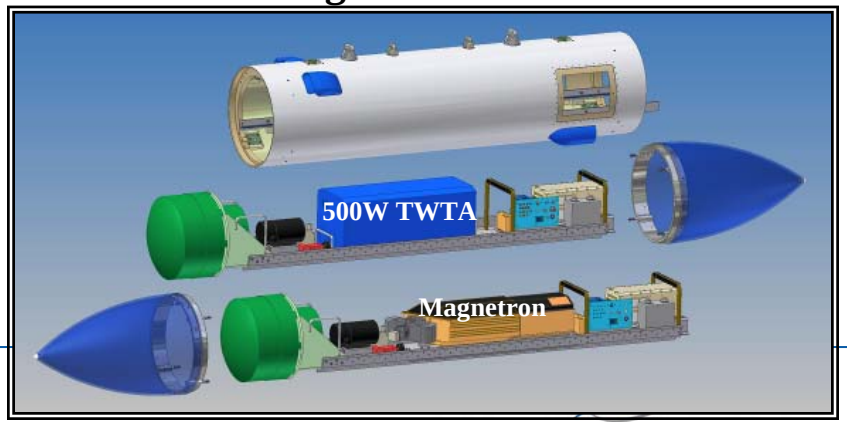
- The configurable AST-9 simulates airborne radar and missile systems using high power traveling wave tube and magnetron transmitters, operating in H-J bands.

- First flights began in FY07 in support of 3rd Fleet training exercises.
- 7 pods have been delivered so far with 6 more scheduled for CY07. 30 total pods.

AN/AST-9 Pod



Traveling Wave Tube Amplifier Variant
&
Magnetron Variant



Combat Environment Simulation Division Products

- **Threat simulators-RF, IR, UV for T&E Ranges such as ECR at China Lake.**
  - Development
  - Acquisition
  - T&E
  - Validation documentation

- **Electronic Warfare systems for the major DON aircrew Tactical Training Ranges**.
  - Development
  - Acquisition
  - Integration
  - Upgrades

- **Navy Threat / Simulator Validation Program Coordination**
  - Independent of Devel Offices/Joint Val Member
  - Develop and maintain validation procedures
  - Review validation Reports
  - Maintain database and schedules


Fallon Threat Emitter


Cherry Pt Mobile SAM


AN/GPQ-11(V)2-2

Examples of Current/Future Focus Areas

- New Subscale DT (BQM-74E replacement)
- Future testing of Hi Diver variant of SSST
- Seaborne target swarm capability for Fleet training
- VBSS support to Navy, Coast Guard, Home Land Security
- Advanced Ground Target Threat System/Land Target Development
- Intrepid Tiger Phase II Communications Jammer
- Future testing of MSST

Threat/Target Systems Department Summary

- **T/TSD has tremendous operations and engineering capability**
- **We operate wherever the customer needs us**
- **We are committed to constant improvement**
- **The Military Value of our products and services is recognized by our Navy, DOD and FMS Customers**
- **We see many opportunities**
  - Target Operations World Wide
  - New Target Developments
  - Homeland Security exercise scenario support

NAVAIR